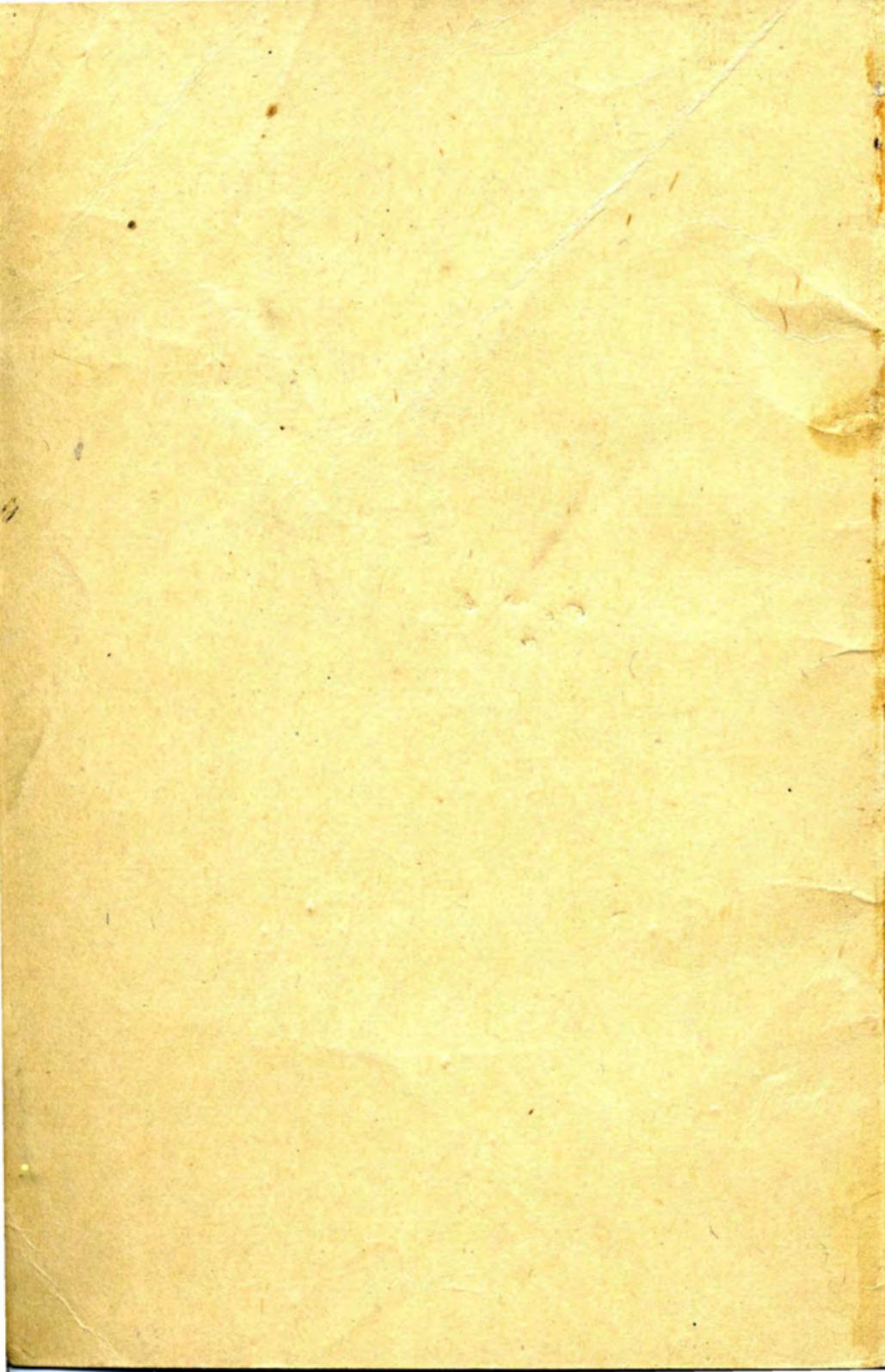


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FT 6-F-1

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**FIRING TABLES**  
FOR  
**GUN, 6-INCH, SEACOAST**  
**M1900, M1903A2, AND**  
**M1905A2**  
FIRING  
**SHELL, H. E., MK.IIA2**

1944



FT 6-F-1

**FIRING TABLES**  
FOR  
**GUN, 6-INCH, SEACOAST**  
**M1900, M1903A2, AND M1905A2**  
FIRING  
**SHELL, H. E., MK. IIA2**  
WITH  
**FUZE, P. D., M51 AND MODS.**

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Prepared by the  
Ordnance Department, U. S. A.  
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177-1

DURING TABLES

FOR

CHINESE, JAPANESE, AND KOREAN

MISSIONS, AND OTHERS

BY

SHREVE, H. E., SURVEYOR

GENERAL

OF THE U. S. GEOLOGICAL SURVEY

WASHINGTON

Geological Department, U. S. G.

1880



UNITED STATES

DEPARTMENT OF THE INTERIOR

WASHINGTON, D. C.

Army Service Forces, Ordnance Office,  
Washington, 21 March 1944.

The following firing tables (FT 6-F-1) for the GUN, 6-inch, M1900, M1903A2, and M1905A2, firing SHELL, H.E., MK.IIA2 w/FUZE, P.D., M51 and mods are published for the information and guidance of all concerned.

L. H. CAMPBELL, Jr.,  
Major General, Chief of Ordnance.

THE UNIVERSITY OF CHICAGO  
DIVISION OF THE PHYSICAL SCIENCES

REPORT OF THE COMMITTEE ON THE  
PROGRESS OF THE PHYSICAL SCIENCES  
IN THE UNITED STATES OF AMERICA  
FOR THE YEAR 1954

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1955

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## GUN, 6-INCH, M1900, M1903A2, AND M1905A2

INTRODUCTION

When standard Coast Artillery fire control instruments are available for preparing data for firing on moving or fixed targets, the battery commander will have little need for these firing tables. They become useful only for reference, since mechanical devices apply the necessary corrections for the various effects on range and deflection. Standard panoramic sights for Coast Artillery are designed to utilize azimuths in laying for direction.

1. GENERAL INFORMATION. These tables are based on firings of the H.E. Shell Mk.IIA1 variant E later standardized to H.E. Shell Mk.IIA2 fired from the 6" Gun M1903A2 No. 63 mounted on 6" Barbette Carriage M1 No. 103 conducted at Aberdeen Proving Ground, Maryland during June 1943 and recorded in A.P.G. Firing Record No. P-24205, and supplemental firings of the same shell fired from the 6" Gun M1905 No. 12 during September 1943 at Aberdeen Proving Ground and recorded in A.P.G. Firing Record No. P-26514. Temperature of Powder Effects are based on firings conducted with H.E. Shell Mk.IIA1 fired from the 6" Gun M1903A2 No. 30 during September and October 1942 and recorded in A.P.G. Firing Record No. P-10148. The  $B_0$  drag coefficient was used in the reduction of firings.

## 2. CHARACTERISTICS.

- a. Guns. (See chart on following page.)
- b. Carriage. (See chart on following page.)

## 3. PROJECTILE.

Shell, H.E., Mk.IIA2

## 4. FUZE.

Fuze, P.D., M51 AND MODS

a. Gun	M1900	M1903A2	M1905A2
Diameter of bore between lands	6	6	6
Diameter of bore between grooves	6.10	6.10	6.10
Total length of gun	310.4	310.40	309.80
Length of rifled portion	254.14	254.66	250.286
Travel of projectile	257.35	257.87	255.056
Length of powder chamber obturator face to shell base	42.40	42.21	44.96
Maximum diameter of powder chamber	8.00	8.00	8.00
Capacity of powder chamber	2082	2082	2122
Number of grooves	54	54	54
Character of rifling	Increasing	Uniform	Uniform
Twist of rifling	1 in 50 to	1 in 25	1 in 25
	calibers	calibers	calibers
Maximum pressure	38,000	38,000	38,000
	lb./sq.in.		
b. Carriage, Barbette	Barbette M1900	Barbette M1900	Barbette M1
Total traverse	ml	ml	ml
Least possible elevation	6400	6400	6400
Maximum elevation	-88.9	-88.9	-5
One turn of traversing handwheel	355.6	844.5	47.5
One turn of elevating handwheel	49.42	18.49	1.040
One turn of elevating handwheel	6.58	23	1.294
	deg.	deg.	deg.

5. EXPLANATION OF THE TABLES. This firing table has been divided into two parts. Part 1, printed on white paper, comprises data applicable in the most part to any possible combination of projectile, fuze, and powder charge, and will serve equally well for all firing tables. Part 2 gives data pertaining to a particular combination of projectile, fuze, and powder charge. It is readily distinguished from Part 1 by a difference in the color of the paper upon which it is printed.

Throughout the tables, certain conditions are assumed as standard. Mention may be made of the following:

Wind, none.

Muzzle velocity, 2770 f/s.

Weight of projectile, 90 lb.

Air density at battery, (59°F. and 29.53 in. of mercury) 525.9 grains per cubic foot.

Temperature of powder, 70°F.

Temperature of air at battery (for elasticity effect), 59°F.

In addition to the standard air conditions at the battery, a standard atmospheric structure aloft has been assumed. The observed ranges, obtained from test firings, upon which these tables are based, were corrected on the basis of a comparison of observed muzzle velocity, weight of projectile, air conditions at all altitudes with the assumed standards and for rotation of the earth.

In connection with Part 1, it is to be noted that the azimuth of a wind is indicated by reference to the direction from which it blows. Since the meteorological message gives the azimuth of the wind as measured clockwise from the north, it is necessary to find the equivalent tabular direction before proceeding with the use of the wind component chart. This tabular azimuth or chart direction of the wind is therefore measured in mils (6400 to the circle) clockwise from the plane of fire, that is from the direction toward which the gun is fired. The choice of signs for cross wind effects accords with the deflection graduations upon the standard panoramic sight. For example, a wind from the left, when the target is viewed from the position of the gun, will carry the projectile to the right. To correct for this, it is necessary to traverse the gun to the left, and this corresponds to an increased deflection setting on the sight. The

effect of such a wind, being opposite in sign to the correction, is thus seen to be negative.

Although the maximum wind speed noted on this chart is only ten miles per hour, it is not to be understood that this figure is in any way intended as a restricting limit on the use of the data of the chart itself. Thus to obtain the components of a 12 mi/hr wind the components of a 10 mi/hr wind can be added to the corresponding components of a 2 mi/hr wind.

The other tables, formulae, and charts of Part 1 require no individual discussion. The principal use of the information contained in Part 1 is in the conversion of the data of the meteorological message into a form that is directly applicable to a particular battery.

Table A of Part 2 gives the range elevation relation, maximum ordinate, ballistic coefficient, and the characteristics of the trajectory at the point of fall. The ranges listed in column (1) and throughout the tables are "curved" ranges; that is, they are regarded as measured along the surface of the sphere concentric with the earth and passing through the gun. Such measurements are understood to be made from the gun to the points where the trajectories pierce this spherical surface; or in case of the correction tables for the height of target, to points on this surface directly above or below the target. These points are all at the same height above sea level as the gun, and hence may be called "level points". It should be emphasized that no correction for curvature of the earth should be applied to these ranges. Whenever the level points concerned are at the target or directly above or below it, it is evident that these ranges are equal to the geographical distance from muzzle to target such as would be read from an accurate map, and they will later be referred to as "map ranges". Such ranges are sensibly equal to the rectilinear distances between gun and level point, though the straight line joining these points would not be exactly horizontal at the gun. In connection with range settings in general, and with especial reference to cases where gun and target are at different levels, the term "range" is sometimes used less exactly to refer to distances from gun to level points not related to the target.

The tabular elevations, given in columns (2) and (3), are strictly exact only when the gun and target are at the same level. In this case the elevation coincides with the quadrant elevation. For other cases see Tables B and C. The word "change" in the headings (4) and (5), (6) and (7) is employed because in each of these columns there are tabulated mean values to be used for decreases as well as increases. The probable errors in range and deflection are given in columns (16) and (17). These probable errors are based on the observed (uncorrected) ranges and deflections obtained during the range firings upon which these firing tables are based. The characteristics of the trajectory at the point of fall are given in columns (9), (10), (11), and (12). The ballistic coefficient, column (15), is the so-called "normal" or "short arc" C. Its value is such that when it is used with the standard muzzle velocity and angle of departure for the computation of the trajectory by the method of numerical integration, the resulting range will be that tabulated.

The deflection due to drift is found in columns (13) and (14) of Table A. Thus, with no cross wind, and the absence of accidental disturbance, these columns give the total deviation of the projectile from the plane of fire, (the vertical plane containing the axis of the piece when laid for firing). The signs used are in accord with the deflection graduations upon the standard panoramic sight. The negative sign indicates that the projectile is carried to the right.

It is to be noted that in this case and throughout the tabulation of differential variations, the signs given are those of the effects and not of the corrections. For example, the effect is given as positive if the trajectory is so altered that the projectile is caused to fall beyond its normal objective point.

The effect of the earth's rotation on range and deflection is a function of the latitude of the gun and of the azimuth of the plane of fire. It cannot, therefore, be incorporated in elevation and drift columns. This effect becomes quite appreciable in the case of long range guns. The effect of rotation of the earth on range is given in Table E, and the effect on deflection is given in Table K. It is to be noted that the azimuth is measured clockwise from the north.

Tables B and C are for use when the target is below or above the level of the gun. For example in the table for target below gun, (Table B), for any given map range and height of target, the quantity appearing as the "range effect" is the distance by which the map range for the given target exceeds the "range to level point", when the latter range is determined for that standard trajectory whose continuation passes through the target. These "effects", then, are given positive signs so that the correction may be made by subtracting them from the map range. The resulting corrected range is that range whose corresponding angle of elevation (as listed in Table A) is to be used as the elevation required to strike the target, (provided we assume for the moment that there are no other variations from standard).

Tables D to I inclusive give the various differential effects on range: thus, Table F gives the range effects corresponding to an increase or decrease in muzzle velocity of every 10 feet per second up to 150 feet per second.

Tables J and K give the effects on deflection due, respectively, to cross wind, and to rotation of the earth.

Although cant of the carriage axle, by changing the angle of departure, has some effect upon the range, that effect is here disregarded; for, at low elevations, a fairly large cant will produce only a very small change in the angle of departure, and at high elevations, where a large cant will produce a somewhat larger change in angle of departure than at low elevations, it requires a quite large change in departure to produce a small change in range.

Among the symbols and abbreviations used are the following:

$\omega$	(read: "omega"), meaning the quadrant angle of fall for gun and target at the same level.
P.E.	probable error
lb.	pound
deg.	degrees
min.	minutes
sec.	seconds

μ	mils
in.	inches
ft.	feet
yds.	yards
f/s	feet per second
mi/hr	miles per hour
F.	Fahrenheit
m.d.p.	meteorological datum plane
%	per cent
M.V.	muzzle velocity
V-V <sub>0</sub>	velocity adjustment

6. THE METEOROLOGICAL MESSAGE. The meteorological message consists of groups of symbols arranged in codified form. The message starts with the repetition of the so-called "address of the sending station", consisting of three letters, the first of which is always M, the other two serving to identify the station. All the groups subsequent to the first group, which plays a special role, are similar in type and significance; they differ only in that they refer to different altitudes. They consist of seven digits.

With reference to the first group, if the meteorological message applies to antiaircraft or other high angle fire, the first figure is 2; if it applies to terrestrial fire other than high angle, the first figure is 3. For the 6" Guns, M1900, M1903A2, and M1905A2 firing 90 lb. H.E. Shell, Mk.IIA2 use message 3 at all elevations. The second and third digits of this first group give, in hundreds of feet, the altitude of the meteorological datum plane (m.d.p.) above sea level. The position of the m.d.p. is chosen by the Meteorological Service of the Army and should be little, if any, higher than the lowest battery to be served by the message. The fourth and fifth digits of this group give the temperature at the m.d.p. in degrees Fahrenheit.

The groups subsequent to the first have digits assigned to them as symbols, beginning with zero and refer to altitudes as follows:

- 0 The level of the m.d.p.
- 1 An altitude of 600 feet (200 yards) above m.d.p.
- 2 An altitude of 1500 feet (500 yards) above m.d.p.

3	An altitude of 3000 feet	(1000 yards) above m.d.p.
4	An altitude of 4500 feet	(1500 yards) above m.d.p.
5	An altitude of 6000 feet	(2000 yards) above m.d.p.
6	An altitude of 9000 feet	(3000 yards) above m.d.p.
7	An altitude of 12000 feet	(4000 yards) above m.d.p.
8	An altitude of 15000 feet	(5000 yards) above m.d.p.
9	An altitude of 18000 feet	(6000 yards) above m.d.p.
0	An altitude of 24000 feet	(8000 yards) above m.d.p.
1	An altitude of 30000 feet	(10000 yards) above m.d.p.
2	An altitude of 36000 feet	(12000 yards) above m.d.p.

Each further increase by unity in the symbol of the altitude zone corresponds to an increase of 6000 feet in altitude above the m.d.p. It is evident that no confusion can arise from using the symbols 0, 1, 2, etc., for 10, 11, 12, etc. in order to preserve the 7 digit character of the group. The first digit of each of these groups is the group symbol mentioned above and designates the altitude zone to which the group refers. The second and third indicate the direction from which the ballistic wind blows. For this purpose the angular deviation is measured clockwise from the north in hundreds of mils (64 points to the circle). The fourth and fifth digits in each of these groups constitute a two figure symbol for the speed of the wind in miles per hour. The sixth and seventh digits serve to designate the ballistic density in per cent of normal.

The particular group of the meteorological message appropriate for use with a particular trajectory is that group of which the altitude is nearest to, but not less than, the maximum ordinate. When extreme accuracy is necessary and the meteorological data justify the procedure, it is possible to interpolate between groups of the meteorological message, making use of the exact maximum ordinate.

The above mentioned is a special case of the general method dealing with the meteorological data for battery and m.d.p. at any levels. The meteorological message is designed primarily for batteries in or near the m.d.p. When serious differences in level occur, the data of the meteorological message must be corrected to the level of the battery. Maximum ordinates will be measured from the battery level, for all purposes. Such corrections as are made, utilize that 7 digit group of the message

which corresponds to the maximum ordinate so defined. The wind at a given altitude above the battery is assumed to be identical with that at an equal altitude above the m.d.p., but the temperature and ballistic density need separate consideration. The temperature at the battery is obtained either by direct observation or by correcting to the level of the battery the temperature given in the first group of the meteorological message. This correction is made by means of the Thermometric Formula, Part 1B.

The ballistic density depends upon the maximum ordinate considered. Any one of the 7 figure groups of the message gives the ballistic density for a certain maximum ordinate measured from the m.d.p. This density when corrected by means of the Density Formula, Part 1B, becomes the ballistic density for that maximum ordinate measured from the battery.

7. USE OF THE TABLES. When standard Coast Artillery instruments are not available, it is necessary to prepare firing data by computations, using the firing tables as explained hereafter.

For convenience in reference, the differential variations and the corresponding corrections will be considered in three groups. The designation of the groups of corrections, in the order in which they will be treated, are:

- a. Position corrections
- b. Materiel corrections
- c. Weather corrections

This grouping corresponds in a general way to the order in which the data for the corrections are obtained. When the corrections refer to changes in deflection, they are so indicated. Otherwise they refer to changes in range. When all the variations from standard are numerically small, and hence comparable in magnitude, it is known that a slight increase in formal accuracy is secured by making these corrections successively; that is, by correcting the map range to account for the first variation considered, and using the resulting first corrected range as a basis for determining the magnitude of the second variation, and so forth. In most cases which will occur in practice, this increase in formal accuracy is meaningless, since the data themselves are seldom known with sufficient refinement to warrant the slight

apparent gain in accuracy. Consequently, for general use with this table, all corrections may be calculated on the basis of the same fundamental quantity, namely, the map range. At the same time should it prove more convenient, there is no objection to imposing the corrections successively, except where some one of the corrections is much larger than the others. The only case which occurs frequently enough to warrant particular consideration is that of a large correction due to height of target. For this situation it has been verified that greater accuracy is secured by imposing simultaneously the velocity and height of site corrections than by imposing these corrections successively in either order.

a. Position Corrections are determinable as soon as the relative location of gun and target is known. For land firing, their geographical location would determine both the map range and the difference in altitude; for seacoast batteries, the height of the tide may also be required. Position corrections consist of those of (1) differences in altitude of gun and target, (2) corrections for rotation of the earth and (3) deflection due to drift. Tables B and C give the effects on range due to a height of target below and above the gun, respectively.

b. Materiel Corrections are determinable, for a given range, when the weight and the markings of the projectile and the relatively permanent characteristics of the particular piece and powder lot are known. These corrections consist of those for (1) variations from normal in weight of projectile and (2) estimated change in muzzle velocity,  $(V-V_0)$ , due to the conditions of the piece or of the powder when the powder is at standard powder temperature ( $70^{\circ}\text{F}$ ). The correction due to variation in weight of projectile is obtained from Part 2, Table D for a percentage change in weight from standard. The estimated change in muzzle velocity is called the velocity adjustment,  $V-V_0$ , and is made by reference to the record of performance of the particular piece and powder lot, or by other empirical methods. Usually the results of observation of previous firings are available. The necessary correction is then found by the use of the effects tabulated in Part 2, Table F.

c. Weather Corrections are determinable only upon receipt of the regular meteorological message or other reports of observation made at or near the time of firing. These corrections consist of those of (1) air density, (2) air temperature (elasticity effect), (3) range wind, (4) variation of the powder temperature from standard, and (5) deflection effect due to cross wind. The air density, air temperature, range wind, and cross wind, to be used in any case are, respectively, the ballistic density, temperature at the battery, ballistic range wind, and ballistic cross wind, all as given in or obtained from the meteorological message. In the absence of such information it will ordinarily be necessary to utilize such observation of air conditions as can be made at the battery. The maximum ordinate corresponding to the map range for use with the meteorological message is found in Part 2, Table A, column (8).

The speed and direction of the ballistic wind are resolved into components along and across the line of fire by means of the chart of Part 1A. The range component is the ballistic range wind to be used with Part 2, Table I. The cross component is the ballistic cross wind, and the resulting deflection effects are found by reference to Part 2, Table J. The effect of the variations of the powder temperature from the standard powder temperature is found as the effect of an equivalent change in muzzle velocity. This muzzle velocity change may be read from the chart prepared for this purpose (page 9).

The algebraic sum of all of the range effects hitherto mentioned, namely, those due to position variations, materiel variations, and weather variations, are added together algebraically and this algebraic sum subtracted from the map range. This amounts to changing the signs of the effects, thus converting them into the corrections desired, and then adding the corrections to the map range. When these calculations are made previous to a series of firings, the result is known as the initial range, being the range at which firing is begun. With it, entry is made in Part 2, Table A, and the corresponding angle of elevation is read from either column (2) or (3). The deflection effects, when added algebraically, give the total deflection effect, and a change of sign gives the deflection corrections to be used with the panoramic sight.

When observation of fire is possible, the center of impact for succeeding rounds is adjusted to the center of target on the basis of rounds already observed, and the range corresponding to the resultant setting is called the adjusted range. The difference between the adjusted range and the initial range as defined above is assumed to be due to a variation which necessitates a correction to be applied upon  $V-V_0$ . The value of  $V-V_0$  thus continually revised, is called the velocity adjustment and requires reference to Part 2, Table F. It is used in the next firing or in firing at a different range, and is then considered as a materiel correction.

The use of the tables is illustrated by the following example:

Given: Gun, 6" M1903A2; Tabular Muzzle Velocity = 2770 f/s.  
Shell, H.E., Mk.IIA2; Fuze, P.D., M51A1.

Data as to Position:

Altitude of battery = 450 ft. above sea level.  
Map range to target = 16260 yards.  
Height of target = -432 ft. (432 ft. below gun).  
Azimuth of target (measured clockwise from the North) =  
437 mils (24.6°).  
Latitude of the gun = 32° North.

Data as to Materiel:

Weight of projectile = 89 lb. (1.1% below normal).  
Preliminary velocity adjustment ( $V-V_0$ ) = -28 f/s  
(28 f/s below tabular velocity).

Weather Data:

Temperature of powder = 54°F.  
Meteorological message: MSL MSL 30154 0620799  
1591198 2600997 3601096 4611196 5601095 6591195  
7601193

Required: Quadrant Elevation and Deflection Setting.

Solution: The tables found in Parts 1 and 2 are used throughout.

(a) Position Corrections for Range

Entering Table B, for target below gun, we find corresponding to a map range of 16260 yards and a height of

target of -432 ft. a range effect of +177 yds.

Entering Table E, for effects on range due to rotation of earth, we find, corresponding to a latitude of  $32^\circ$  and an azimuth of  $24.6^\circ$  a range effect of +17 yds.

(b) Materiel Corrections for Range

Entering Table D, we find the effect on range for 1.1% decrease in weight of the projectile to be -31 yds.

In a similar manner, from Fb, we find the effect on range for an estimated decrease of -28 f/s in muzzle velocity to be -181 yds.

(c) Weather Corrections for Range

The actual or estimated temperature of the powder at the time of firing being  $54^\circ\text{F.}$ , instead of the standard temperature of  $70^\circ\text{F.}$ , a correction must be introduced.

The effect on muzzle velocity is obtained from the chart on page 9 and is -7 f/s. The effect on range thus occasioned is found in the same manner as above from Table Fb, to be -46 yds.

To obtain the effects of the remaining variations, the meteorological message must be deciphered and such information as is applicable to the particular trajectory considered must be utilized.

From column (8) of Table A, the maximum ordinate is found to be about 7160 ft. so that in addition to the introductory information obtained in the meteorological message only that group of the message numbered 6 which gives data for a maximum ordinate of 9000 ft. will be used.

From the meteorological message the following information is obtained:

Altitude of the m.d.p. above mean sea level	100 ft.
Temperature at the m.d.p.	$54^\circ\text{F.}$
Azimuth of the ballistic wind (for group "6")	5900 m
Velocity of the ballistic wind (for group "6")	11 mi/hr
Ballistic density (for group "6")	95%

To obtain the components of the ballistic wind, it is necessary to secure from the recorded azimuths of target and ballistic wind, the chart direction of the wind for which the line of fire is the reference direction. Subtracting 437 mils from 5900 mils, we have for the chart direction from which the wind is blowing

5463  $\mu$

Using the Wind Component Chart, Part 1A, with 11 mi/hr as the wind velocity we have corresponding to 5463 mils a range component  $W_x$ , of -6.6 mi/hr and a cross component  $W_y$ , of -8.8 mi/hr

(The components of 1 mi/hr are added to the corresponding components of 10 mi/hr to obtain the components of 11 mi/hr.)

Entering Table Ib, we find the effect on range for -6.6 mi/hr range wind (the negative sign here indicates a head wind) to be -98 yds.

The temperature at the m.d.p. given in the meteorological message cannot be used directly since the battery is 350 ft. above the m.d.p.

Using the Thermometric Formula, Part 1B, the decrease in temperature for this height is 1°F., so that the temperature for the battery is 53°F.

Entering Table H, we find the temperature (elasticity) effect on range for a temperature of 53°F. (or 6°F. below the normal temperature of 59°F.) to be +12 yds.

Likewise the ballistic density given in the meteorological message for this trajectory cannot be used directly since the battery is 350 ft. above the m.d.p.

Using the Density Formula, Part 1B, the decrease in density for this height is 1% so that the ballistic density for the battery is 94%

Entering Table Ga, we find the effect on range for the ballistic air density of 94% (or 6% below normal) to be +566 yds.

The total range effect is now obtained by adding the separate range effects algebraically. It has the value of  $+177+17-31-181-46-98+12+566 = +416$  yds.

The total range correction is obtained by merely changing the sign of the total range effect. It is  
-416 yds.

The corrected range, found by adding algebraically the total correction to the map range (or what is the same thing, subtracting algebraically the total effect) is  $16260-416$ , i.e. 15844 yds.

The elevation corresponding to the corrected range of 15844 yds. is found in either column 2 or 3 of Table A. From column 2, it is 351.8  $\mu$

The deflection effects are found in a similar manner.

The deflection effect due to a  $-8.8$  mi/hr cross wind (from left to right) is found from Table J to be  $-6$   $\mu$

The drift is found from column (13) or (14) of Table A. From column (13), it is  $-17$   $\mu$

The deflection effect due to rotation of the earth for a latitude of  $32^\circ$  North and an azimuth of  $24.6^\circ$  is found from Table K to be  $-1$   $\mu$

The total deflection effect is obtained by adding algebraically the separate deflection effects. It has the value of  $-6-17-1 = -24$   $\mu$

The total deflection correction is obtained by merely changing the sign of the total deflection effect. It is  $+24$   $\mu$

The deflection set off at the gun will be 24 mils (24 mils to the left) when the target is used as aiming point. For any other aiming point 24 mils must be added to the deflection of the target. To obtain the azimuth setting it must be recalled that deflections and azimuths are measured in opposite senses. The correction of  $+24$  mils in deflection is the same as a correction of  $-24$  mils in azimuth. The azimuth setting then is 437 mils minus 24 mils = 413  $\mu$

The total length is now obtained by adding the  
two parts together. It has the  
same length as the original. The  
total length is now obtained by adding the  
two parts together. It has the  
same length as the original.

The corrected total length by adding the  
two parts together. It has the  
same length as the original. The  
total length is now obtained by adding the  
two parts together. It has the  
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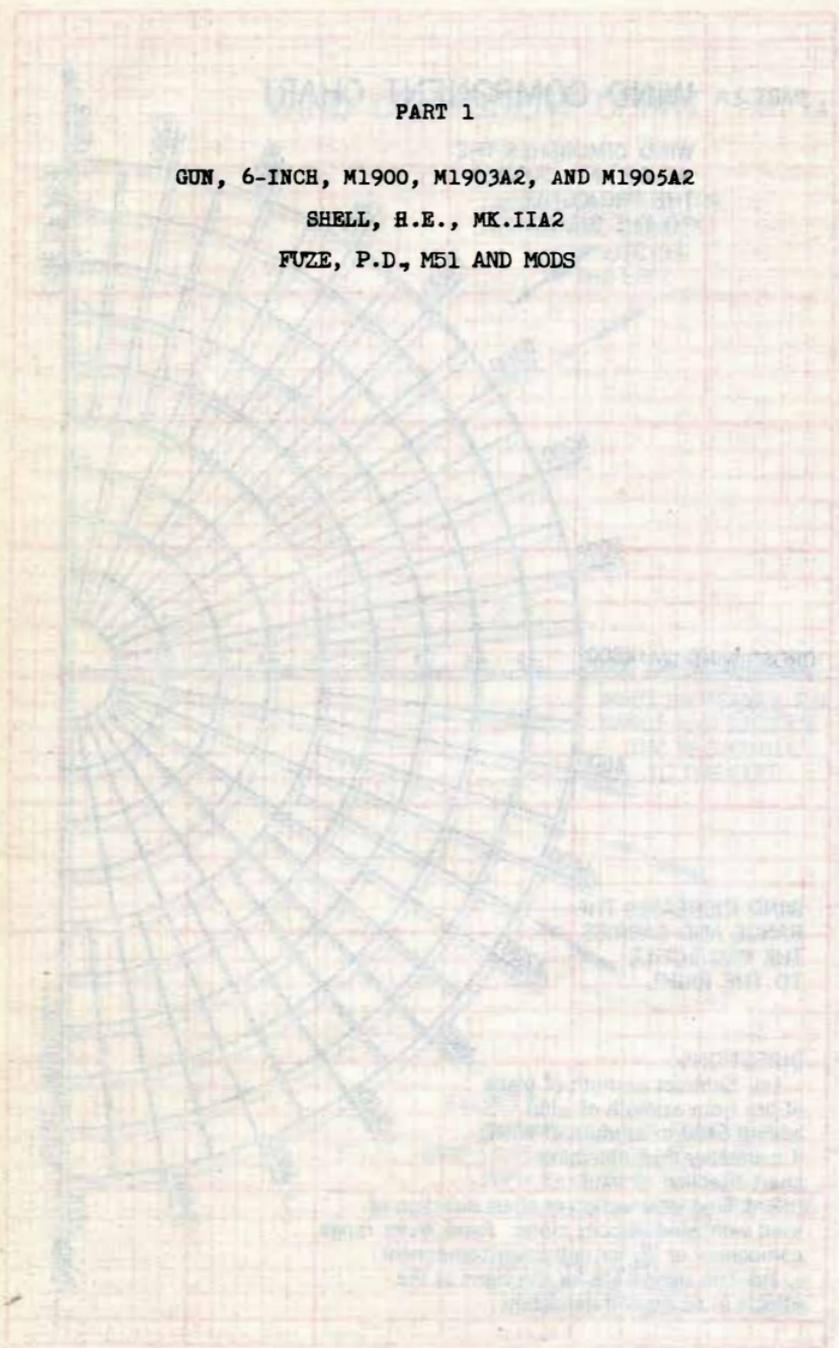
The corrected total length by adding the  
two parts together. It has the  
same length as the original. The  
total length is now obtained by adding the  
two parts together. It has the  
same length as the original.

PART 1

GUN, 6-INCH, M1900, M1903A2, AND M1905A2

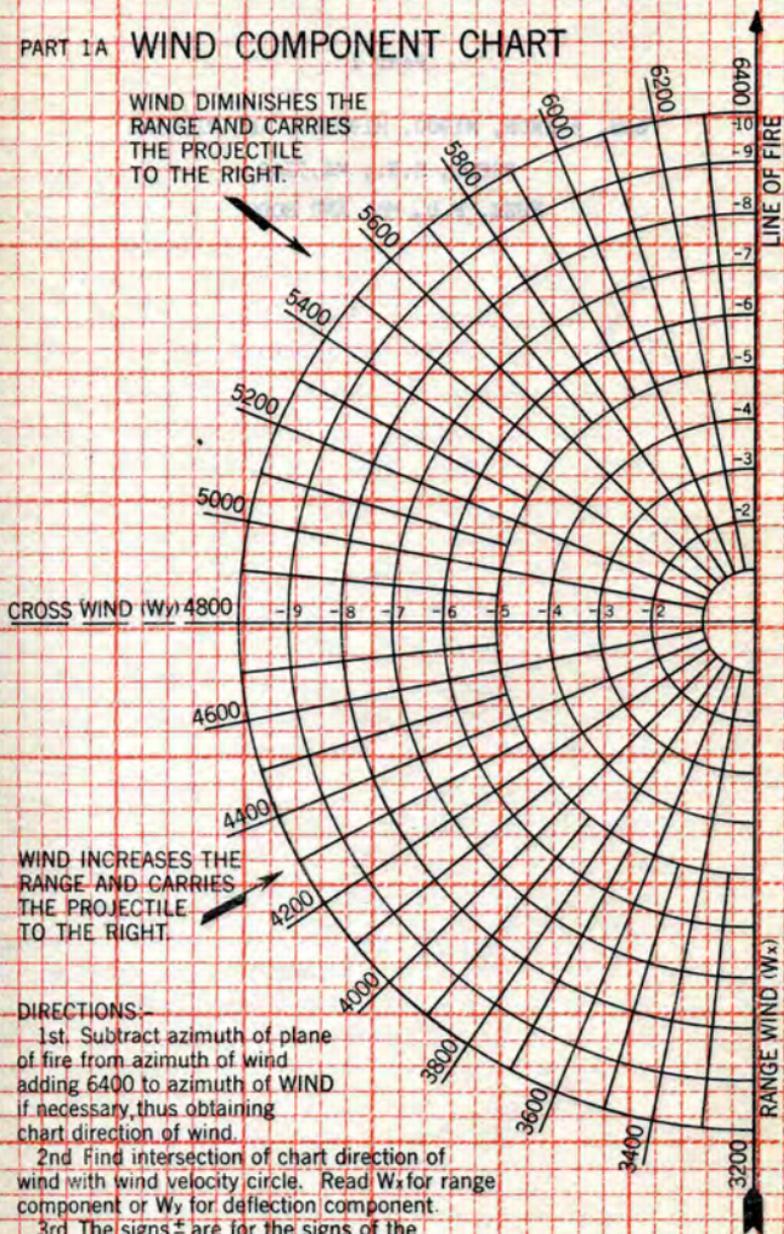
SHELL, H.E., MK.IIA2

FUZE, P.D., M51 AND MODS



## PART 1A WIND COMPONENT CHART

WIND DIMINISHES THE RANGE AND CARRIES THE PROJECTILE TO THE RIGHT.

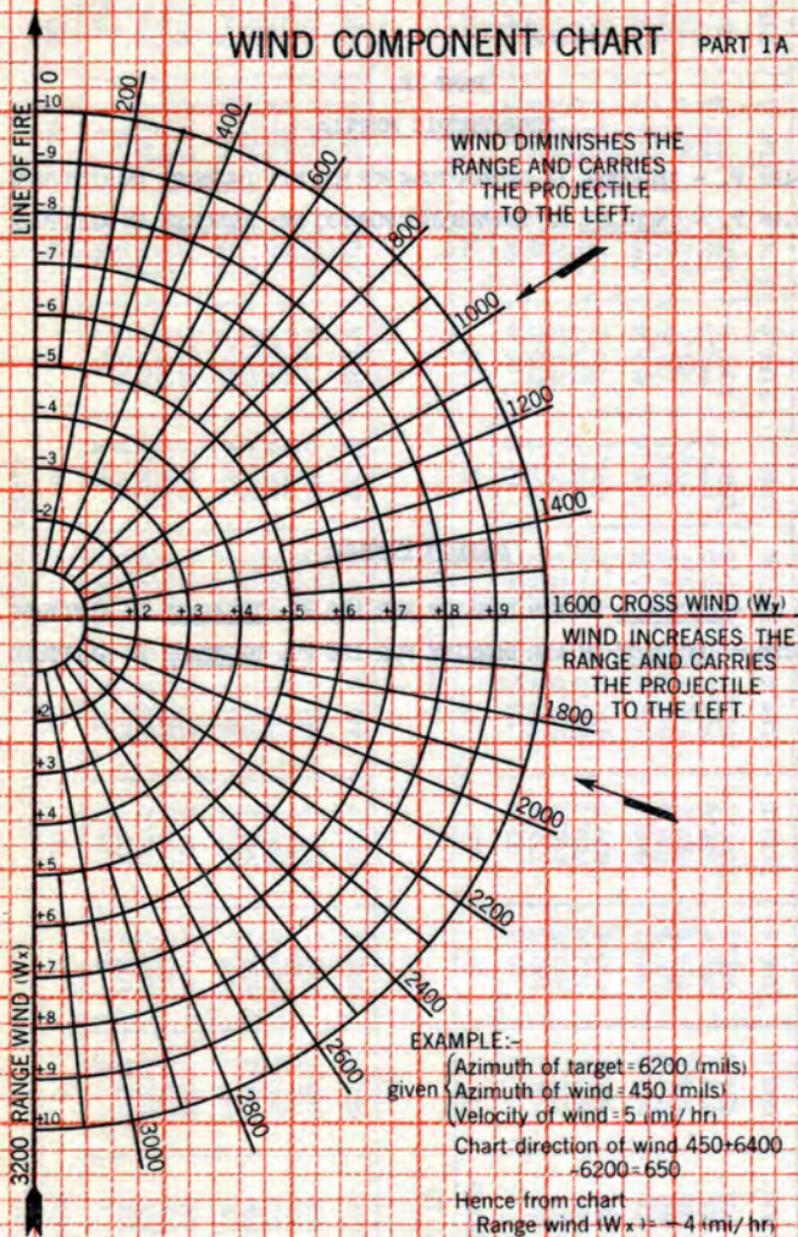


WIND INCREASES THE RANGE AND CARRIES THE PROJECTILE TO THE RIGHT.

### DIRECTIONS:-

- 1st. Subtract azimuth of plane of fire from azimuth of wind adding 6400 to azimuth of WIND if necessary, thus obtaining chart direction of wind.
- 2nd Find intersection of chart direction of wind with wind velocity circle. Read  $W_x$  for range component or  $W_y$  for deflection component.
- 3rd The signs  $\pm$  are for the signs of the effects in range and deflection.

# WIND COMPONENT CHART PART 1A



EXAMPLE:-  
 (Azimuth of target = 6200 (mils)  
 given Azimuth of wind = 450 (mils)  
 Velocity of wind = 5 (mi/hr)  
 Chart direction of wind  $450 + 6400$   
 $= 6200 = 650$   
 Hence from chart  
 Range wind  $(W_x) = -4$  (mi/hr)  
 Cross wind  $(W_y) = +3$  (mi/hr)

## PART 1B.

THERMOMETRIC FORMULA

0.2° F. = DECREASE IN TEMPERATURE FOR 100 FT. INCREASE IN ALTITUDE

0.2° F. = INCREASE IN TEMPERATURE FOR 100 FT. DECREASE IN ALTITUDE

## DENSITY FORMULA

0.3% = DECREASE IN AIR DENSITY FOR 100 FT. INCREASE IN ALTITUDE

0.3% = INCREASE IN AIR DENSITY FOR 100 FT. DECREASE IN ALTITUDE

## PART 1C

1 yd = 0.91440 meters

YARDS	0	10	20	30	40	50	60	70	80	90
0	0	9.1	18.3	27.4	36.6	45.7	54.9	64.0	73.2	82.3
100	91.4	100.6	109.7	118.9	128.0	137.2	146.3	155.4	164.6	173.7
200	182.9	192.0	201.2	210.3	219.5	228.6	237.7	246.9	256.0	265.2
300	274.3	283.5	292.6	301.8	310.9	320.0	329.2	338.3	347.5	356.6
400	365.8	374.9	384.0	393.2	402.3	411.5	420.6	429.8	438.9	448.1
500	457.2	466.3	475.5	484.6	493.8	502.9	512.1	521.2	530.4	539.5
600	548.6	557.8	566.9	576.1	585.2	594.4	603.5	612.7	621.8	630.9
700	640.1	649.2	658.4	667.5	676.7	685.8	695.0	704.1	713.2	722.4
800	731.5	740.7	749.8	759.0	768.1	777.2	786.4	795.5	804.7	813.8
900	823.0	832.1	841.2	850.4	859.5	868.7	877.8	887.0	896.1	905.3
1000	914.4	923.6	932.7	941.8	951.0	960.1	969.3	978.4	987.6	996.7

YARDS TO METERS

## PART 1D

1 meter = 1.0936 yd.

METERS	0	10	20	30	40	50	60	70	80	90
0	0	10.9	21.9	32.8	43.7	54.7	65.6	76.6	87.5	98.4
100	109.4	120.3	131.2	142.2	153.1	164.0	175.0	185.9	196.8	207.8
200	218.7	229.7	240.6	251.5	262.5	273.4	284.3	295.3	306.2	317.2
300	328.1	339.0	350.0	360.9	371.8	382.8	393.7	404.6	415.6	426.5
400	437.4	448.4	459.3	470.2	481.2	492.1	503.1	514.0	524.9	535.9
500	546.8	557.7	568.7	579.6	590.6	601.5	612.4	623.4	634.3	645.2
600	656.2	667.1	678.0	689.0	699.9	710.8	721.8	732.7	743.7	754.6
700	765.5	776.5	787.4	798.3	809.3	820.2	831.1	842.1	853.0	864.0
800	874.9	885.8	896.8	907.7	918.6	929.6	940.5	951.4	962.4	973.3
900	984.2	995.2	1006.1	1017.1	1028.0	1038.9	1049.9	1060.8	1071.7	1082.7
1000	1093.6	1104.6	1115.5	1126.4	1137.4	1148.3	1159.2	1170.2	1181.1	1192.0

METERS TO YARDS

## PART 1E

## ANGULAR CONVERSION TABLE - DEGREES TO MILS

Degrees	0	1	2	3	4	5	6	7	8	9
0	0	18	36	53	71	89	107	124	142	160
10	178	196	213	231	249	267	284	302	320	338
20	356	373	391	409	427	444	462	480	498	516
30	533	551	569	587	604	622	640	658	676	693
40	711	729	747	764	782	800	818	836	853	871
50	889	907	924	942	960	978	996	1013	1031	1049
60	1067	1084	1102	1120	1138	1156	1173	1191	1209	1227
70	1244	1262	1280	1298	1316	1333	1351	1369	1387	1404
80	1422	1440	1458	1476	1493	1511	1529	1547	1564	1582
90	1600	(Conversion Factor, 1° = 17.77778 mils)								

## PART 1F

## NATURAL TRIGONOMETRIC FUNCTIONS

Mils	N. Sin	N. Cos	N. Tan	N. Cot
0	0.0000	1.0000	0.0000	-
50	.0491	.9988	.0491	20.355
100	.0980	.9952	.0985	10.153
150	.1467	.9892	.1483	6.741
200	.1951	.9808	.1989	5.027
250	.2430	.9700	.2505	3.992
300	.2903	.9569	.3033	3.297
350	.3369	.9415	.3578	2.795
400	.3827	.9239	.4142	2.414
450	.4276	.9040	.4730	2.114
500	.4714	.8819	.5345	1.871
550	.5141	.8577	.5994	1.668
600	.5556	.8315	.6682	1.497
650	.5957	.8032	.7416	1.348
700	.6344	.7730	.8207	1.219
750	.6716	.7410	.9063	1.103
800	.7071	.7071	1.0000	1.000
850	.7410	.6716	1.103	.9063
900	.7730	.6344	1.219	.8207
950	.8032	.5957	1.348	.7416
1000	.8315	.5556	1.497	.6682
1050	.8577	.5141	1.668	.5994
1100	.8819	.4714	1.871	.5345
1150	.9040	.4276	2.114	.4730
1200	.9239	.3827	2.414	.4142
1250	.9415	.3369	2.795	.3578
1300	.9569	.2903	3.297	.3033
1350	.9700	.2430	3.992	.2505
1400	.9808	.1931	5.027	.1989
1450	.9892	.1467	6.741	.1483
1500	.9952	.0980	10.153	.0985
1550	.9988	.0491	20.355	.0491
1600	1.0000	0.0000	-	0.0000



## PART 1H

## TABLE OF SLOPE COEFFICIENTS

$$\sin \omega / \sin (\omega + n)$$

ε n, positive (relative forward slope)		ω										
		1 10	2 20	3 31	5 51	10 102	15 152	20 201	30 297	40 388	50 472	1,600
50	.81	.71	.62	.50	.33	.25	.20	.15	.12	.10	.05	
100	.93	.83	.77	.66	.50	.40	.34	.26	.21	.18	.10	
150	.94	.88	.83	.75	.60	.50	.43	.36	.29	.26	.15	
200	.95	.91	.87	.80	.67	.58	.51	.42	.36	.32	.20	
250	.96	.93	.89	.83	.72	.63	.57	.48	.41	.37	.25	
300	.97	.94	.91	.86	.75	.68	.61	.52	.46	.42	.30	
350	.97	.95	.92	.88	.79	.71	.65	.57	.51	.47	.36	
400	.98	.95	.93	.89	.81	.74	.69	.61	.55	.51	.41	
500	.98	.96	.95	.92	.85	.79	.74	.67	.62	.58	.53	
600	.99	.97	.96	.93	.87	.83	.78	.72	.67	.64	.67	
700	.99	.98	.97	.94	.90	.85	.82	.76	.72	.69	.82	
800	.99	.98	.97	.95	.91	.88	.85	.80	.77	.75	1.00	
900	.99	.98	.98	.96	.93	.90	.88	.84	.81	.79	1.22	
1000	.99	.99	.98	.97	.94	.92	.90	.87	.85	.84	1.50	
1100	.99	.99	.98	.98	.95	.94	.92	.90	.89	.88	1.87	
1200	1.00	.99	.99	.98	.97	.95	.94	.93	.92	.93	2.41	

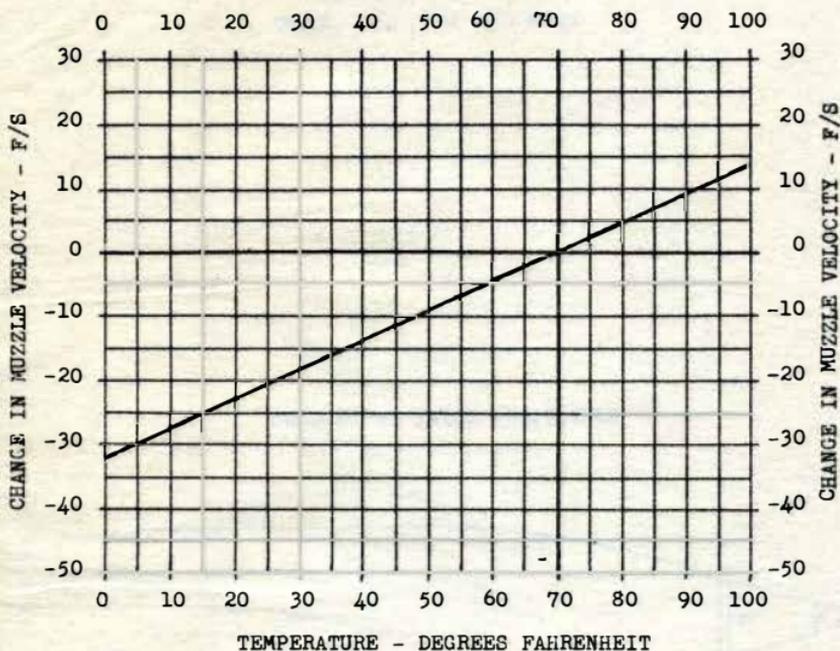
ε -n, positive (relative reverse slope)		ω										
		1 10	2 20	3 31	5 51	10 102	15 152	20 201	30 297	40 388	50 472	
50	1.26	1.69	2.57									
100	1.11	1.26	1.44	2.03								
150	1.07	1.16	1.25	1.51	3.08							
200	1.05	1.11	1.18	1.34	2.02	4.11						
250	1.04	1.09	1.14	1.25	1.67	2.52	5.06					
300	1.03	1.07	1.11	1.20	1.50	2.00	2.99	94.86				
350	1.03	1.06	1.09	1.16	1.39	1.74	2.31	6.46				
400	1.02	1.05	1.08	1.14	1.32	1.59	1.97	3.78	31.39			
500	1.02	1.04	1.06	1.10	1.24	1.41	1.63	2.38	4.33	17.31		
600	1.02	1.03	1.05	1.08	1.18	1.30	1.46	1.89	2.68	4.44		
700	1.01	1.03	1.04	1.07	1.14	1.24	1.35	1.65	2.10	2.86		
800	1.01	1.02	1.03	1.05	1.12	1.19	1.27	1.49	1.80	2.24		
900	1.01	1.02	1.03	1.04	1.09	1.15	1.22	1.39	1.60	1.90		
1000	1.01	1.01	1.02	1.04	1.08	1.12	1.18	1.31	1.47	1.68		
1100	1.01	1.01	1.02	1.03	1.06	1.10	1.14	1.24	1.37	1.53		
1200	1.00	1.01	1.01	1.02	1.05	1.08	1.11	1.19	1.29	1.41		

n = Slope with respect to line of site (percent and mils) ( $n = n' - s + 300$ ). Directions. Multiply range probable error (from range table) by coefficient shown above. Here  $\omega$  denotes the angle of fall (measured to line of site) (for practical purposes equal to the range table angle of fall which is its value for site 300 m, i.e., for a level trajectory);  $n'$ , the quadrant angle of slope, positive for forward slope (ground rising in enemy direction), and negative for reverse slope (ground falling in enemy direction);  $s = 300$ , the angle of site, positive for target above gun, negative for target below gun;  $n(n = n' - s + 300)$ , the slope relative to the line of site. NOTE. The quadrant angle of fall,  $\omega' = \omega - s + 300$ . EXAMPLE: Given target on reverse slope between contour lines 130 ft., and 140 ft., mean distance between contours = 67 ft., site = -20 mils, ( $s = 280$ ), angle of fall (tabulated) = 250 mils, range probable error (in range table) = 83 yards.

Then,  $n'$  (in percent) =  $100 \frac{(130-140)}{67} = -15(\%)$  or -152 mils,  $n' - s + 300 = -152 - (-20) = -132$  mils. Interpolating between 1.67 (for 102 mils) and 2.52 (for 152 mils), slope coefficient =  $1.67 + \frac{30}{50} \times 0.85 = 2.18$ . Hence, range probable error to be used =  $2.18 \times 83$  yd. = 181 yards.

CHART FOR CHANGE IN MUZZLE VELOCITY FOR TEMPERATURE OF  
POWDER DIFFERENT FROM NORMAL

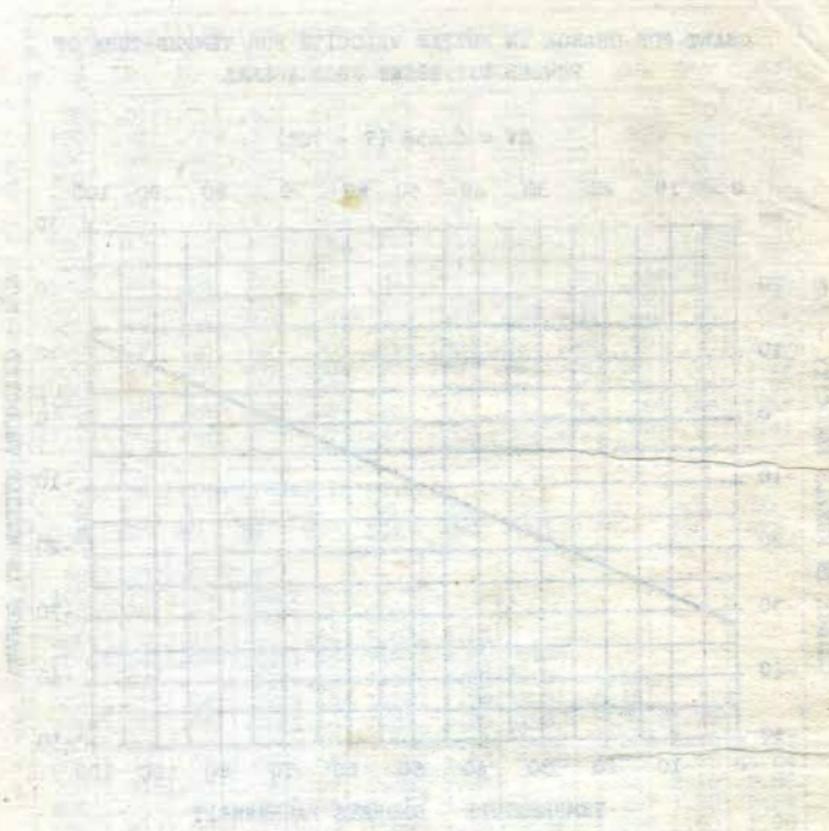
$$\Delta V = 0.458 (T - 70^\circ)$$



**DIRECTIONS:** - Enter chart with temperature of powder. Follow vertical line to the slanting line; from there follow the horizontal line either to the left or right edge of the chart, where the change in muzzle velocity may be read.

**EXAMPLE:** - Suppose temperature of powder = 83°F. Standard muzzle velocity = 2770 f/s. From the chart, the change in muzzle velocity is +6 f/s and the muzzle velocity to be expected is 2776 f/s.

TEMPERATURE DEPENDENCE OF THE RATE OF REACTION

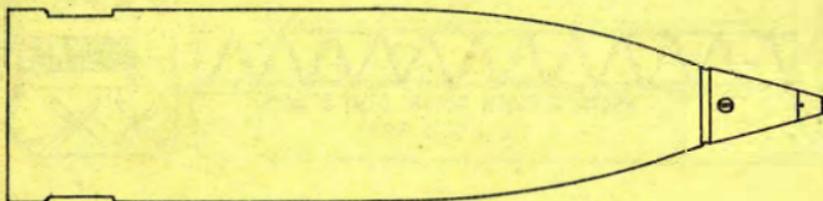


The rate of reaction increases rapidly with temperature. This is characteristic of a chemical reaction where the activation energy is high. The curve shows that at 10°C the reaction is very slow, but it becomes significantly faster as the temperature rises to 20°C and above. The rate continues to increase exponentially, reaching a value of 1.5 at 60°C.

## PART 2

GUN, 6-INCH, M1900, M1903A2, AND M1905A2  
SHELL, H.E., MK.IIA2  
FUZE, P.D., M51 AND MODS

DRAWING OF FUZED PROJECTILE



Drawing of Band and Band Seat

581096 O - 44 - 3

581096

PLATE I

THE GREAT BRITISH STEAMSHIP COMPANY  
LIMITED  
SHEPPARDSON'S PATENT  
STEAMSHIP

FIGURE 1. SIDE VIEW OF THE GREAT BRITISH STEAMSHIP



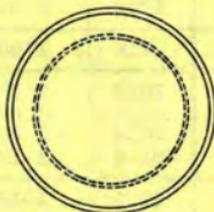
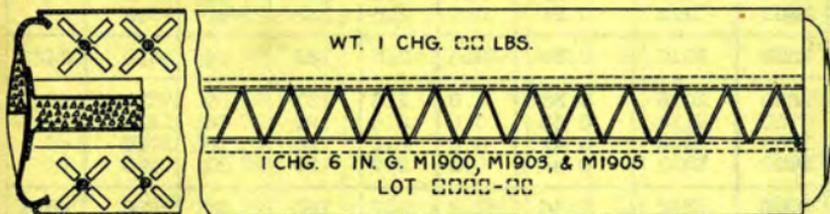
THE GREAT BRITISH STEAMSHIP COMPANY  
LIMITED

## PART 2

SHELL, H.E., MK.IIA2  
FUZE, P.D., M51 AND MODS  
MUZZLE VELOCITY, 2770 F/S

TABLES A-K INCLUSIVE  
JUMP, +0.6 MILS

DRAWING OF CHARGE  
(SINGLE SECTION TYPE)



SHELL, H.E., MK.IIA2  
FUZE, P.D., M51A1  
MUZZLE VELOCITY, 2770 F/S

PART 2 TABLE A

Range  (1)	Elevation  (2) (3)		Change in elev for 100 yd change in range  (4) (5)		Change in range for 1 mil 1 min change in elev  (6) (7)		Maxi- mum ordinate  (8)	Termi- nal veloc- ity  (9)
	yd	mil	deg min	mil	min	yd		
0	-0.6	-0 02	0.6	2.2	154	46	0	2770
100	0.0	0 00	0.6	2.2	152	46	0	
200	+0.8	+0 03	0.7	2.2	151	45	0	
300	1.4	0 05	0.7	2.2	149	45	0	
400	2.0	0 07	0.7	2.3	148	44	1	
500	2.8	0 09	0.7	2.3	146	44	2	2655
600	3.4	0 11	0.7	2.3	145	43	2	
700	4.2	0 14	0.7	2.3	143	43	3	
800	4.8	0 16	0.7	2.4	142	43	4	
900	5.6	0 19	0.7	2.4	140	42	4	
1000	6.4	0 21	0.7	2.4	139	42	5	2541
1100	7.0	0 23	0.7	2.4	138	41	6	
1200	7.6	0 26	0.7	2.5	136	41	8	
1300	8.4	0 28	0.7	2.5	135	40	9	
1400	9.2	0 31	0.7	2.5	133	40	10	
1500	10.0	0 33	0.8	2.5	132	39	12	2427
1600	10.6	0 36	0.8	2.6	131	39	14	
1700	11.4	0 38	0.8	2.6	129	38	16	
1800	12.2	0 41	0.8	2.6	128	38	18	
1900	13.0	0 44	0.8	2.7	126	37	20	
2000	13.8	0 46	0.8	2.7	125	37	22	2314
2100	14.6	0 49	0.8	2.7	124	36	25	
2200	15.4	0 52	0.8	2.8	122	36	28	
2300	16.2	0 55	0.8	2.8	121	36	31	
2400	17.0	0 57	0.8	2.8	119	35	34	
2500	17.8	1 00	0.9	2.9	118	35	37	2202
2600	18.8	1 03	0.9	2.9	117	34	40	
2700	19.6	1 06	0.9	2.9	115	34	44	
2800	20.4	1 09	0.9	3.0	114	33	48	
2900	21.4	1 12	0.9	3.0	112	33	51	
3000	22.2	1 15	0.9	3.1	111	33	55	2093
3100	23.2	1 18	0.9	3.1	110	32	60	
3200	24.2	1 21	0.9	3.1	108	32	65	
3300	25.0	1 24	0.9	3.2	107	31	70	
3400	26.0	1 28	1.0	3.2	105	31	75	
3500	27.0	1 31	1.0	3.3	104	31	80	1986

SHELL, H.E., MK.IIA2  
 FUZE, P.D., M51A1  
 MUZZLE VELOCITY, 2770 F/S

PART 2 TABLE A

Angle of fall		Slope of fall	Deflection due to drift		Ballistic coefficient	Probable error in R		Time of flight	Range
(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)
mil	deg min	1 on—	mil	deg		yd	yd	sec	yd
0	0 00		0	0.00	2.32	43	0	0.0	0
1	0 03	1479						0.1	100
2	0 06	744						0.2	200
3	0 08	497						0.3	300
4	0 10	373						0.4	400
4	0 12	298	0	0.00	2.32	43	0	0.6	500
5	0 14	249						0.7	600
5	0 17	214						0.8	700
6	0 19	187						0.9	800
7	0 22	166						1.0	900
8	0 24	149	0	0.00	2.32	43	0	1.1	1000
8	0 26	135						1.2	1100
9	0 29	123						1.4	1200
10	0 31	113						1.5	1300
10	0 34	104						1.6	1400
11	0 36	97	0	0.00	2.32	43	0	1.7	1500
12	0 39	90						1.8	1600
13	0 41	84						2.0	1700
13	0 44	79						2.1	1800
14	0 47	74						2.2	1900
15	0 49	70	-1	0.00	2.32	44	1	2.3	2000
16	0 52	66						2.5	2100
17	0 55	62						2.6	2200
17	0 58	59						2.7	2300
18	1 01	56						2.9	2400
19	1 04	53	-1	-0.05	2.32	44	1	3.0	2500
20	1 08	50						3.1	2600
21	1 11	48						3.3	2700
22	1 15	46						3.4	2800
23	1 18	44						3.5	2900
24	1 22	42	-1	-0.05	2.32	44	1	3.7	3000
26	1 26	40						3.8	3100
27	1 30	38						4.0	3200
28	1 34	36						4.1	3300
29	1 39	35						4.3	3400
30	1 43	33	-1	-0.05	2.32	44	1	4.4	3500

SHELL, H.E., MK.IIA2  
FUZE, P.D., M51A1  
MUZZLE VELOCITY, 2770 F/S

PART 2 TABLE A

Range	Elevation		Change in elev for 100 yd change in range		Change in range for		Maximum ordinate	Terminal velocity
	(1)	(2) (3)	(4) (5)	1 mil 1 min	change in elev	(6) (7)		
yd	mil	deg min	mil	min	yd	yd	ft	f/s
3500	27.0	1 31	1.0	3.3	104	31	80	1986
3600	28.0	1 34	1.0	3.3	103	30	85	
3700	29.0	1 38	1.0	3.3	101	30	91	
3800	30.0	1 41	1.0	3.4	100	29	97	
3900	31.0	1 45	1.0	3.4	98	29	103	
4000	32.0	1 48	1.0	3.5	97	29	109	1882
4100	33.0	1 51	1.0	3.5	96	28	115	
4200	34.0	1 55	1.1	3.6	94	28	122	
4300	35.2	1 59	1.1	3.6	93	28	130	
4400	36.2	2 02	1.1	3.7	91	27	138	
4500	37.4	2 06	1.1	3.7	90	27	146	1782
4600	38.4	2 10	1.1	3.8	89	26	153	
4700	39.6	2 14	1.1	3.8	88	26	161	
4800	40.8	2 18	1.2	3.9	86	26	170	
4900	42.0	2 22	1.2	3.9	85	25	179	
5000	43.2	2 26	1.2	4.0	84	25	188	1686
5100	44.4	2 30	1.2	4.1	83	25	198	
5200	45.6	2 34	1.2	4.2	81	24	208	
5300	46.8	2 38	1.2	4.2	80	24	218	
5400	48.0	2 42	1.3	4.3	79	23	229	
5500	49.4	2 47	1.3	4.4	78	23	240	1595
5600	50.6	2 51	1.3	4.4	76	23	251	
5700	52.0	2 55	1.3	4.5	75	22	263	
5800	53.2	2 59	1.3	4.5	74	22	276	
5900	54.6	3 04	1.4	4.6	73	22	289	
6000	56.0	3 09	1.4	4.7	72	21	302	1509
6100	57.4	3 14	1.4	4.8	71	21	316	
6200	58.8	3 19	1.4	4.8	70	21	330	
6300	60.2	3 24	1.5	4.9	69	20	345	
6400	61.8	3 29	1.5	5.0	68	20	360	
6500	63.2	3 33	1.5	5.1	67	20	376	1429
6600	64.8	3 38	1.5	5.1	66	19	392	
6700	66.2	3 43	1.5	5.2	65	19	409	
6800	67.8	3 49	1.6	5.3	64	19	426	
6900	69.4	3 54	1.6	5.4	63	18	444	
7000	71.0	3 59	1.6	5.5	62	18	463	1356

SHELL, H.E., MK.IIA2  
 FUZE, P.D., M51A1  
 MUZZLE VELOCITY, 2770 F/S

PART 2 TABLE A

Angle of fall		Slope of fall	Deflection due to drift		Ballistic coefficient	Probable error in R Df		Time of flight	Range
(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)
mil	deg min	1 on—	mil	deg		yd	yd	sec	yd
30	1 43	33	-1	-0.05	2.32	44	1	4.4	3500
32	1 48	32						4.6	3600
33	1 53	30						4.7	3700
35	1 58	29						4.9	3800
36	2 03	28						5.0	3900
38	2 08	27	-1	-0.05	2.32	44	2	5.2	4000
40	2 14	26						5.3	4100
41	2 19	25						5.5	4200
43	2 25	24						5.7	4300
45	2 31	23						5.8	4400
47	2 38	22	-1	-0.10	2.32	44	2	6.0	4500
49	2 44	21						6.1	4600
51	2 51	20						6.3	4700
53	2 58	19.3						6.5	4800
55	3 05	18.6						6.6	4900
57	3 12	17.9	-2	-0.10	2.32	44	2	6.8	5000
59	3 19	17.2						7.0	5100
61	3 27	16.6						7.2	5200
64	3 35	16.0						7.4	5300
66	3 43	15.4						7.5	5400
69	3 52	14.8	-2	-0.10	2.32	45	3	7.7	5500
71	4 01	14.3						7.9	5600
74	4 10	13.8						8.1	5700
77	4 19	13.3						8.3	5800
79	4 28	12.8						8.5	5900
82	4 38	12.4	-2	-0.15	2.32	45	3	8.6	6000
85	4 47	11.9						8.8	6100
88	4 57	11.5						9.0	6200
91	5 07	11.1						9.2	6300
94	5 18	10.8						9.4	6400
97	5 29	10.5	-2	-0.15	2.32	45	3	9.6	6500
101	5 40	10.1						9.9	6600
104	5 51	9.8						10.1	6700
108	6 03	9.4						10.3	6800
111	6 15	9.1						10.5	6900
115	6 27	8.9	-3	-0.15	2.32	45	4	10.7	7000

SHELL, H.E., MK.IIA2  
FUZE, P.D., M51A1  
MUZZLE VELOCITY, 2770 F/S

PART 2 TABLE A

Range (1)	Elevation (2) (3)		Change in elev for 100 yd change in range (4) (5)		Change in range for 1 mil 1 min change in elev (6) (7)		Maximum ordinate (8)	Terminal velocity (9)	
	yd	mil	deg	min	mil	min			yd
7000	71.0	3 59	1.6	5.5	62	18	463	1356	
7100	72.6	4 05	1.6	5.6	61	18	482		
7200	74.4	4 11	1.7	5.6	60	18	502		
7300	76.0	4 16	1.7	5.7	59	17	523		
7400	77.6	4 22	1.7	5.8	58	17	544		
7500	79.4	4 28	1.8	5.9	57	17	565	1291	
7600	81.2	4 34	1.8	6.0	56	17	587		
7700	83.0	4 40	1.8	6.1	55	16	610		
7800	84.8	4 46	1.8	6.2	54	16	634		
7900	86.6	4 52	1.9	6.3	53	16	659		
8000	88.6	4 59	1.9	6.4	53	16	684	1233	
8100	90.6	5 05	1.9	6.5	52	15	710		
8200	92.6	5 12	2.0	6.6	51	15	737		
8300	94.6	5 19	2.0	6.7	50	15	765		
8400	96.6	5 26	2.0	6.8	49	15	793		
8500	98.6	5 33	2.1	6.9	49	15	822	1183	
8600	100.6	5 40	2.1	7.0	48	14	852		
8700	102.6	5 47	2.1	7.1	47	14	883		
8800	104.8	5 54	2.2	7.2	46	14	915		
8900	107.0	6 01	2.2	7.3	46	14	948		
9000	109.2	6 09	2.2	7.4	45	14	981	1140	
9100	111.4	6 17	2.2	7.6	44	13	1015		
9200	113.8	6 24	2.3	7.7	44	13	1050		
9300	116.0	6 32	2.3	7.8	43	13	1086		
9400	118.4	6 40	2.3	7.9	43	13	1124		
9500	120.6	6 48	2.4	8.0	42	13	1163	1103	
9600	123.0	6 55	2.4	8.1	42	12	1203		
9700	125.4	7 03	2.4	8.2	41	12	1244		
9800	128.0	7 12	2.5	8.3	41	12	1286		
9900	130.4	7 20	2.5	8.4	40	12	1328		
10000	132.8	7 29	2.5	8.5	39	12	1371	1072	
10100	135.4	7 37	2.6	8.6	39	11	1416		
10200	138.0	7 46	2.6	8.8	38	11	1462		
10300	140.6	7 55	2.6	8.9	38	11	1509		
10400	143.4	8 04	2.7	9.0	37	11	1557		
10500	146.0	8 13	2.7	9.1	37	11	1607	1046	

SHELL, H.E., MK.IIA2

FUZE, P.D., M51A1

MUZZLE VELOCITY, 2770 F/S

PART 2 TABLE A

Angle of fall		Slope of fall	Deflection due to drift		Ballistic coefficient	Probable error in R Df		Time of flight	Range
(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)
mil	deg min	1 on—	mil	deg		yd	yd	sec	yd
115	6 27	8.9	-3	-0.15	2.32	45	4	10.7	7000
118	6 39	8.6						10.9	7100
122	6 52	8.3						11.1	7200
126	7 05	8.1						11.4	7300
130	7 18	7.8						11.6	7400
134	7 31	7.6	-3	-0.20	2.32	46	4	11.8	7500
138	7 44	7.4						12.0	7600
142	7 58	7.1						12.3	7700
146	8 12	6.9						12.5	7800
150	8 27	6.7						12.7	7900
155	8 42	6.6	-3	-0.20	2.32	46	5	13.0	8000
159	8 57	6.4						13.2	8100
164	9 12	6.2						13.5	8200
168	9 27	6.0						13.7	8300
173	9 43	5.8						14.0	8400
178	9 59	5.7	-4	-0.20	2.32	47	5	14.2	8500
182	10 15	5.5						14.5	8600
187	10 32	5.4						14.7	8700
192	10 49	5.2						15.0	8800
197	11 06	5.1						15.3	8900
203	11 23	5.0	-4	-0.25	2.32	47	6	15.5	9000
208	11 40	4.8						15.8	9100
213	11 58	4.7						16.0	9200
218	12 16	4.6						16.3	9300
223	12 34	4.5						16.6	9400
229	12 53	4.4	-5	-0.25	2.33	48	6	16.9	9500
234	13 11	4.3						17.1	9600
240	13 30	4.2						17.4	9700
246	13 49	4.1						17.7	9800
251	14 08	4.0						18.0	9900
257	14 28	3.9	-5	-0.30	2.33	49	7	18.3	10000
263	14 47	3.8						18.5	10100
269	15 07	3.7						18.8	10200
275	15 27	3.6						19.1	10300
281	15 47	3.5						19.4	10400
287	16 08	3.5	-6	-0.30	2.34	50	7	19.8	10500

SHELL, H.E., MK.IIA2  
FUZE, P.D., M51A1  
MUZZLE VELOCITY, 2770 F/S

PART 2 TABLE A

Range  (1)	Elevation  (2) (3)		Change in elev for 100 yd change in range  (4) (5)		Change in range for 1 mil 1 min change in elev  (6) (7)		Maximum ordinate  (8)	Terminal velocity  (9)		
	yd	mil	deg	min	mil	min			yd	yd
10500	146.0	8 13	2.7	9.1	37	11	1607	1046		
10600	148.8	8 23	2.8	9.3	36	11	1658			
10700	151.6	8 32	2.8	9.4	36	10	1710			
10800	154.4	8 41	2.8	9.6	35	10	1763			
10900	157.2	8 51	2.9	9.7	35	10	1817			
11000	160.0	9 01	2.9	9.8	34	10	1873	1024		
11100	163.0	9 10	3.0	10.0	34	10	1930			
11200	166.0	9 20	3.0	10.1	33	10	1988			
11300	169.0	9 30	3.0	10.2	33	10	2048			
11400	172.0	9 41	3.1	10.4	32	9	2109			
11500	175.0	9 52	3.1	10.5	32	9	2172	1006		
11600	178.2	10 02	3.2	10.7	32	9	2236			
11700	181.4	10 12	3.2	10.8	31	9	2301			
11800	184.6	10 23	3.2	10.9	31	9	2368			
11900	188.0	10 34	3.3	11.1	30	9	2437			
12000	191.2	10 46	3.3	11.2	30	9	2507	991		
12100	194.6	10 57	3.4	11.4	30	9	2578			
12200	198.0	11 08	3.4	11.5	29	8	2651			
12300	201.4	11 20	3.5	11.7	29	8	2726			
12400	205.0	11 32	3.5	11.8	28	8	2802			
12500	208.4	11 43	3.6	12.0	28	8	2880	978		
12600	212.0	11 55	3.6	12.2	28	8	2959			
12700	215.6	12 07	3.7	12.4	27	8	3040			
12800	219.4	12 19	3.7	12.5	27	8	3123			
12900	223.0	12 32	3.8	12.6	27	8	3208			
13000	226.8	12 45	3.8	12.7	26	8	3294	968		
13100	230.6	12 57	3.9	12.9	26	8	3382			
13200	234.4	13 10	3.9	13.0	26	8	3472			
13300	238.4	13 23	4.0	13.2	25	7	3564			
13400	242.2	13 37	4.0	13.3	25	7	3657			
13500	246.2	13 51	4.0	13.4	25	7	3752	960		
13600	250.2	14 04	4.1	13.6	24	7	3849			
13700	254.4	14 17	4.1	13.7	24	7	3948			
13800	258.4	14 31	4.2	13.9	24	7	4049			
13900	262.6	14 46	4.2	14.0	24	7	4151			
14000	266.8	15 00	4.3	14.2	23	7	4255	953		

SHELL, H.E., MK.IIA2  
 FUZE, P.D., M51A1  
 MUZZLE VELOCITY, 2770 F/S

PART 2 TABLE A

Angle of fall		Slope of fall	Deflection due to drift		Ballistic coefficient	Probable error in R Dfl		Time of flight	Range
(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)
mil	deg min	1 on—	mil	deg		yd	yd	sec	yd
287	16 08	3.5	-6	-0.30	2.34	50	7	19.8	10500
293	16 29	3.4						20.1	10600
299	16 50	3.3						20.4	10700
306	17 11	3.2						20.7	10800
312	17 32	3.2						21.0	10900
318	17 53	3.1	-6	-0.35	2.34	52	8	21.3	11000
324	18 14	3.0						21.5	11100
331	18 36	3.0						21.8	11200
337	18 58	2.9						22.1	11300
344	19 20	2.8						22.4	11400
350	19 42	2.8	-7	-0.40	2.35	54	8	22.8	11500
357	20 05	2.7						23.1	11600
364	20 28	2.7						23.4	11700
371	20 51	2.6						23.7	11800
377	21 13	2.6						24.0	11900
384	21 36	2.5	-8	-0.45	2.35	56	9	24.4	12000
391	22 00	2.5						24.7	12100
398	22 23	2.4						25.0	12200
405	22 46	2.4						25.4	12300
412	23 10	2.3						25.7	12400
419	23 34	2.3	-9	-0.50	2.34	58	10	26.0	12500
426	23 58	2.2						26.4	12600
433	24 22	2.2						26.7	12700
440	24 46	2.2						27.0	12800
447	25 10	2.1						27.4	12900
454	25 35	2.1	-9	-0.55	2.34	61	11	27.7	13000
462	25 59	2.0						28.1	13100
469	26 23	2.0						28.4	13200
476	26 48	1.98						28.8	13300
483	27 13	1.94						29.2	13400
490	27 38	1.91	-10	-0.60	2.34	63	11	29.5	13500
498	28 03	1.88						29.9	13600
506	28 28	1.84						30.2	13700
514	28 53	1.81						30.6	13800
521	29 18	1.78						31.0	13900
528	29 44	1.75	-11	-0.65	2.33	66	12	31.3	14000

SHELL, H.E., MK.IIA2  
FUZE, P.D., M51A1  
MUZZLE VELOCITY, 2770 F/S

PART 2 TABLE A

Range  (1)	Elevation  (2) (3)		Change in elev for 100 yd change in range  (4) (5)		Change in range for 1 mil 1 min change in elev  (6) (7)		Maximum ordinate  (8)	Terminal velocity  (9)
	yd	mil	deg min	mil	min	yd		
14000	266.8	15 00	4.3	14.2	23	7	4255	953
14100	271.0	15 14	4.3	14.4	23	7	4361	
14200	275.4	15 28	4.3	14.5	23	7	4469	
14300	279.6	15 43	4.4	14.7	23	7	4579	
14400	284.0	15 58	4.4	14.8	23	7	4691	
14500	288.4	16 13	4.5	15.0	22	7	4806	948
14600	292.8	16 28	4.5	15.1	22	7	4923	
14700	297.4	16 43	4.5	15.3	22	7	5040	
14800	301.8	16 59	4.6	15.4	22	6	5160	
14900	306.4	17 14	4.6	15.6	22	6	5285	
15000	311.0	17 30	4.7	15.7	21	6	5410	946
15100	315.6	17 45	4.7	15.9	21	6	5535	
15200	320.4	18 01	4.8	16.1	21	6	5660	
15300	325.2	18 17	4.8	16.2	21	6	5790	
15400	330.0	18 33	4.8	16.4	21	6	5925	
15500	334.8	18 50	4.9	16.5	20	6	6060	946
15600	339.6	19 06	4.9	16.6	20	6	6200	
15700	344.6	19 23	5.0	16.8	20	6	6340	
15800	349.6	19 40	5.0	17.0	20	6	6480	
15900	354.6	19 57	5.1	17.1	20	6	6625	
16000	359.6	20 14	5.1	17.3	20	6	6770	947
16100	364.8	20 31	5.2	17.4	19	6	6920	
16200	370.0	20 48	5.2	17.6	19	6	7070	
16300	375.2	21 06	5.2	17.8	19	6	7225	
16400	380.4	21 24	5.3	18.0	19	6	7380	
16500	385.6	21 42	5.3	18.2	19	6	7540	950
16600	391.0	22 00	5.4	18.3	18	6	7700	
16700	396.4	22 18	5.4	18.5	18	5	7865	
16800	401.8	22 36	5.5	18.7	18	5	8030	
16900	407.4	22 55	5.6	18.9	18	5	8200	
17000	413.0	23 14	5.6	19.1	18	5	8375	956
17100	418.6	23 32	5.7	19.3	18	5	8550	
17200	424.2	23 51	5.7	19.5	17	5	8725	
17300	430.0	24 11	5.8	19.7	17	5	8905	
17400	435.8	24 31	5.9	19.9	17	5	9090	
17500	441.8	24 51	6.0	20.1	17	5	9280	963

SHELL, H.E., MK.IIA2  
 FUZE, P.D., M51A1  
 MUZZLE VELOCITY, 2770 F/S

PART 2 TABLE A

Angle of fall		Slope of fall	Deflection due to drift		Ballistic coefficient	Probable error in R D1		Time of flight	Range
(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)
mil	deg min	1 on—	mil	deg		yd	yd	sec	yd
528	29 44	1.75	-11	-0.65	2.33	66	12	31.3	14000
536	30 09	1.72						31.7	14100
544	30 34	1.69						32.1	14200
551	31 00	1.66						32.5	14300
559	31 25	1.64						32.9	14400
566	31 51	1.61	-12	-0.70	2.33	69	13	33.2	14500
574	32 16	1.58						33.6	14600
581	32 42	1.56						34.0	14700
589	33 07	1.53						34.4	14800
596	33 32	1.51						34.8	14900
604	33 58	1.48	-14	-0.75	2.33	72	14	35.1	15000
611	34 24	1.46						35.5	15100
619	34 49	1.44						35.9	15200
627	35 15	1.42						36.3	15300
634	35 40	1.39						36.7	15400
642	36 05	1.37	-15	-0.80	2.32	75	14	37.1	15500
649	36 31	1.35						37.6	15600
657	36 57	1.33						38.0	15700
664	37 22	1.31						38.4	15800
672	37 47	1.29						38.8	15900
679	38 12	1.27	-16	-0.90	2.32	79	15	39.2	16000
687	38 38	1.25						39.7	16100
694	39 03	1.23						40.1	16200
702	39 28	1.21						40.5	16300
709	39 53	1.20						41.0	16400
716	40 18	1.18	-18	-1.00	2.32	83	16	41.4	16500
724	40 43	1.16						41.8	16600
731	41 08	1.14						42.3	16700
739	41 33	1.13						42.7	16800
746	41 58	1.11						43.2	16900
753	42 23	1.10	-19	-1.10	2.32	87	17	43.6	17000
761	42 48	1.08						44.1	17100
768	43 13	1.06						44.5	17200
776	43 38	1.05						45.0	17300
783	44 03	1.03						45.4	17400
790	44 28	1.02	-21	-1.20	2.33	92	17	45.9	17500

SHELL, H.E., MK.IIA2  
FUZE, P.D., M51A1  
MUZZLE VELOCITY, 2770 F/S

PART 2 TABLE A

Range (1)	Elevation (2) (3)		Change in elev for 100 yd change in range (4) (5)		Change in range for 1 mil 1 min change in elev (6) (7)		Maxi- mum ordinate (8)	Termi- nal veloc- ity (9)
	yd	mil	deg	min	mil	min	yd	ft
17500	441.8	24 51	6.0	20.1	17	5	9280	963
17600	447.8	25 11	6.0	20.4	17	5	9470	
17700	453.8	25 31	6.1	20.6	16	5	9665	
17800	460.0	25 51	6.2	20.9	16	5	9865	
17900	466.2	26 12	6.3	21.2	16	5	10070	
18000	472.4	26 34	6.4	21.5	16	5	10270	972
18100	478.8	26 55	6.5	21.9	16	5	10480	
18200	485.2	27 17	6.6	22.2	15	5	10700	
18300	491.8	27 39	6.7	22.6	15	4	10920	
18400	498.4	28 02	6.8	22.9	15	4	11150	
18500	505.2	28 25	6.9	23.3	15	4	11380	983
18600	512.0	28 48	7.0	23.7	14	4	11620	
18700	519.0	29 12	7.2	24.1	14	4	11860	
18800	526.2	29 36	7.3	24.6	14	4	12110	
18900	533.6	30 01	7.5	25.1	13	4	12370	
19000	541.0	30 26	7.6	25.6	13	4	12630	996
19100	548.6	30 52	7.8	26.2	13	4	12900	
19200	556.6	31 18	8.0	26.8	13	4	13180	
19300	564.6	31 45	8.2	27.5	12	4	13470	
19400	572.8	32 13	8.4	28.2	12	4	13770	
19500	581.2	32 41	8.7	29.0	12	4	14080	1011
19600	590.0	33 10	9.0	29.9	11	3	14400	
19700	599.0	33 40	9.3	30.8	11	3	14730	
19800	608.4	34 11	9.6	31.9	10	3	15070	
19900	618.2	34 44	10.0	33.3	10	3	15430	
20000	628.2	35 19	10.4	35.0	10	3	15800	1027
20100	638.6	35 55	10.9	36.9	9	3	16190	
20200	649.6	36 33	11.5	39.0	9	3	16610	
20300	661.2	37 12	12.2	41.3	8	3	17050	
20400	673.6	37 54	13.0	43.9	8	2	17520	
20500	687.0	38 39	14.0	47.2	7	2	18040	1046
20600	701.6	39 28	15.4	52.0	7	2	18610	
20700	717.8	40 23	17.6	59.4	6	2	19250	
20800	736.8	41 27	21.2	71.5	5	1	20000	
20900	761.2	42 49					20980	
20995	816.6	45 56					23180	1074

SHELL, H.E., MK.IIA2  
FUZE, P.D., M51A1  
MUZZLE VELOCITY, 2770 F/S

PART 2 TABLE A

Angle of fall		Slope of fall	Deflection due to drift		Ballistic coefficient	Probable error in R Dft		Time of flight	Range
(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)
mil	deg min	1 on—	mil	deg		yd	yd	sec	yd
790	44 28	1.02	-21	-1.20	2.33	92	17	45.9	17500
798	44 52	1.00						46.4	17600
805	45 17	0.99						46.9	17700
812	45 42	0.98						47.4	17800
820	46 07	0.96						47.8	17900
827	46 32	0.95	-23	-1.30	2.33	96	18	48.3	18000
834	46 56	0.93						48.8	18100
842	47 21	0.92						49.3	18200
849	47 46	0.91						49.8	18300
857	48 11	0.89						50.3	18400
864	48 37	0.88	-25	-1.40	2.33	100	19	50.8	18500
872	49 02	0.87						51.4	18600
879	49 28	0.86						51.9	18700
887	49 53	0.84						52.5	18800
894	50 19	0.83						53.0	18900
902	50 45	0.82	-27	-1.55	2.34	104	19	53.6	19000
910	51 11	0.80						54.2	19100
918	51 38	0.79						54.8	19200
926	52 04	0.78						55.4	19300
934	52 31	0.77						56.0	19400
942	52 59	0.75	-30	-1.70	2.34	106	20	56.7	19500
950	53 27	0.74						57.4	19600
958	53 55	0.73						58.1	19700
967	54 24	0.72						58.8	19800
976	54 53	0.70						59.6	19900
985	55 23	0.69	-34	-1.90	2.35	107	21	60.3	20000
994	55 53	0.68						61.1	20100
1003	56 24	0.66						61.9	20200
1013	56 57	0.65						62.8	20300
1023	57 32	0.64						63.7	20400
1034	58 09	0.62	-38	-2.15	2.35	107	21	64.6	20500
1045	58 48	0.61						65.6	20600
1058	59 31	0.59						66.8	20700
1073	60 20	0.57						68.2	20800
1091	61 21	0.55						70.0	20900
1130	63 35	0.50	-48	-2.70	2.36	107	21	73.9	20995

SHELL, H.E., MK.IIA2  
 FUZE, P.D., MELAI  
 MUZZLE VELOCITY, 2770 F/S

PART 2 TABLE B

## TARGET BELOW GUN - RANGE EFFECTS IN YARDS

Height of Target	Map Range - Yards						
	1000	1500	2000	2500	3000	3500	4000
Feet							
-10	485	304	215	161	126	101	82
-20	994	618	436	325	254	204	166
-30		944	662	493	384	308	251
-40		1282	894	665	517	413	337
-50			1131	840	652	520	423
-60			1374	1019	789	629	510
-70			1623	1201	928	739	599
-80			1879	1387	1070	850	689
-90				1576	1214	963	780
-100				1769	1360	1077	872
-110				1966	1508	1193	965
-120				2167	1659	1311	1059
-130				2372	1813	1430	1154
-140					1969	1551	1250
-150					2128	1674	1348
-160					2289	1799	1447
-170					2453	1925	1547
-180					2620	2053	1648
-190					2791	2183	1750
-200					2965	2315	1854
-220						2585	2065
-240						2862	2281
-260						3146	2502
-280						3437	2729
-300							2962
-320							3201
-340							3447
-360							3700
-380							3960
-400							
-420							
-440							
-460							
-480							
-500							

SHELL, H.E., MK. IIA2  
FUZE, P.D., M51A1  
MUZZLE VELOCITY, 2770 F/S

## PART 2 TABLE B

## TARGET BELOW GUN - RANGE EFFECTS IN YARDS

Map Range - Yards							Height of Target
4500	5000	5500	6000	6500	7000	7500	Feet
68	57	48	41	35	30	26	-10
137	115	97	82	70	60	52	-20
207	173	146	124	105	90	78	-30
278	232	195	165	140	120	104	-40
349	291	244	206	175	150	130	-50
420	350	294	248	211	181	156	-60
492	410	345	291	247	212	183	-70
566	471	395	334	284	243	209	-80
641	532	446	377	320	274	236	-90
716	594	498	420	356	305	263	-100
792	657	550	463	393	336	289	-110
869	720	602	507	430	367	316	-120
946	784	655	551	467	399	343	-130
1024	848	708	595	504	431	371	-140
1103	912	761	640	542	463	398	-150
1183	977	815	685	580	495	425	-160
1263	1043	869	730	618	527	452	-170
1344	1109	924	776	656	559	480	-180
1426	1176	979	822	695	592	508	-190
1510	1244	1035	868	734	625	536	-200
1679	1382	1148	962	813	692	592	-220
1852	1522	1262	1056	892	758	648	-240
2028	1664	1378	1152	972	825	705	-260
2208	1809	1497	1250	1053	893	763	-280
2391	1957	1618	1349	1135	962	821	-300
2579	2108	1741	1450	1218	1031	880	-320
2771	2262	1865	1552	1302	1101	939	-340
2968	2419	1992	1655	1387	1172	998	-360
3169	2579	2121	1760	1473	1243	1058	-380
3374	2741	2252	1867	1561	1316	1119	-400
3583	2906	2385	1975	1650	1390	1181	-420
3797	3075	2520	2085	1740	1465	1244	-440
4016	3247	2658	2197	1831	1540	1306	-460
4241	3422	2799	2311	1924	1616	1369	-480
4471	3601	2942	2426	2018	1693	1433	-500

SHELL, H.E., MK.IIA2  
 FUZE, P.D., M51A1  
 MUZZLE VELOCITY, 2770 F/S

PART 2 TABLE B

## TARGET BELOW GUN - RANGE EFFECTS IN YARDS

Height of Target Feet	Map Range - Yards						
	7500	8000	8500	9000	9500	10000	10500
-10	26	22	19	17	15	13	12
-20	52	45	39	34	30	27	24
-30	78	68	59	51	45	40	36
-40	104	91	79	69	61	54	48
-50	130	113	98	86	76	67	60
-60	156	135	117	103	91	81	72
-70	183	158	137	120	106	94	84
-80	209	181	157	137	121	108	96
-90	236	204	177	155	137	122	108
-100	263	227	197	172	152	135	120
-110	289	250	217	190	168	149	132
-120	316	273	237	208	184	163	145
-130	343	296	257	225	199	177	157
-140	371	320	278	243	214	190	170
-150	398	344	299	261	230	204	182
-160	425	367	319	279	246	218	194
-170	452	390	339	297	262	232	206
-180	480	414	359	315	278	246	218
-190	508	438	380	333	293	259	230
-200	536	462	401	351	309	273	242
-220	592	510	443	388	341	301	267
-240	648	558	485	424	373	329	291
-260	705	607	527	461	405	357	316
-280	763	656	569	497	436	385	341
-300	821	706	612	534	468	413	366
-320	880	756	655	571	501	442	391
-340	939	807	698	608	533	470	416
-360	998	857	742	646	566	499	442
-380	1058	908	786	684	599	528	467
-400	1119	960	830	722	632	556	492
-420	1181	1012	874	760	665	585	517
-440	1244	1065	919	799	699	615	543
-460	1306	1117	964	838	733	644	569
-480	1369	1170	1009	877	766	673	594
-500		1224	1054	915	799	702	620

SHELL, H.E., MK.IIA2  
FUZE, P.D., M51A1  
MUZZLE VELOCITY, 2770 F/S

## PART 2 TABLE B

## TARGET BELOW GUN - RANGE EFFECTS IN YARDS

Map Range - Yards							Height of Target
11000	11500	12000	12500	13000	13500	14000	Feet
11	10	9	8	7	6	6	-10
21	19	17	15	14	13	12	-20
32	29	26	23	21	19	17	-30
43	38	34	31	28	25	23	-40
54	48	43	39	35	32	29	-50
64	57	51	46	42	39	35	-60
75	67	60	54	49	45	41	-70
86	77	69	62	56	51	46	-80
96	86	77	69	63	57	52	-90
107	96	86	77	70	64	58	-100
118	106	95	85	77	70	64	-110
129	115	103	93	84	76	70	-120
140	125	112	101	91	82	75	-130
151	134	120	108	98	89	81	-140
162	144	129	116	105	95	87	-150
173	154	138	124	112	102	93	-160
183	163	146	131	119	108	98	-170
193	172	154	139	126	114	104	-180
204	182	163	147	133	121	110	-190
215	192	172	155	140	127	116	-200
237	211	189	170	154	140	128	-220
259	231	207	186	168	153	140	-240
281	251	225	202	183	166	151	-260
303	270	242	218	197	179	163	-280
325	290	260	234	211	192	175	-300
347	310	278	250	226	205	187	-320
370	330	296	266	240	218	199	-340
393	350	313	282	255	232	211	-360
415	370	331	298	270	245	223	-380
437	390	349	314	284	258	235	-400
459	410	367	330	298	271	247	-420
482	430	385	346	313	284	259	-440
505	450	403	363	328	298	272	-460
527	470	421	379	342	311	284	-480
550	490	439	395	357	324	296	-500

SHELL, H.E., MK.IIA2  
 FUZE, P.D., M51A1  
 MUZZLE VELOCITY, 2770 F/S

PART 2 TABLE B

## TARGET BELOW GUN - RANGE EFFECTS IN YARDS

Height of Target	Map Range - Yards						
	Feet	14000	14500	15000	15500	16000	16500
-10	6	5	5	5	4	4	4
-20	12	11	10	9	8	8	7
-30	17	16	15	14	13	12	11
-40	23	21	19	18	17	16	15
-50	29	26	24	22	21	20	18
-60	35	32	29	27	25	24	22
-70	41	37	34	32	30	28	26
-80	46	42	39	36	34	31	29
-90	52	48	44	41	38	35	32
-100	58	53	49	45	42	39	36
-110	64	58	54	50	46	43	40
-120	70	64	59	54	50	47	44
-130	75	69	64	59	55	51	47
-140	81	74	69	64	59	55	51
-150	87	80	74	68	63	58	54
-160	93	85	78	72	67	62	58
-170	98	90	83	77	71	66	62
-180	104	95	88	82	76	70	65
-190	110	101	93	86	80	74	69
-200	116	107	99	91	84	78	73
-220	128	117	108	100	93	86	80
-240	140	128	118	109	101	94	88
-260	151	139	128	118	110	102	95
-280	163	150	138	127	118	110	103
-300	175	160	148	137	127	118	110
-320	187	171	158	146	135	126	118
-340	199	182	168	155	144	134	125
-360	211	193	178	165	153	142	133
-380	223	204	188	174	161	150	140
-400	235	215	198	183	170	158	148
-420	247	226	208	192	178	166	155
-440	259	238	219	202	187	174	163
-460	272	249	229	211	196	183	171
-480	284	260	239	221	205	191	178
-500	296	271	250	231	214	199	185

SHELL, H.E., MK.IIA2  
 FUZE, P.D., M51A1  
 MUZZLE VELOCITY, 2770 F/S

PART 2 TABLE B

TARGET BELOW GUN - RANGE EFFECTS IN YARDS

Map Range - Yards								Height of Target
17500	18000	18500	19000	19500	20000	20500	21000	Feet
3	3	3	3	2	2	2		-10
7	6	6	5	5	5	5	5	-20
10	9	9	8	8	7	7	7	-30
14	13	12	11	10	9	9	9	-40
17	16	15	14	12	11	11	11	-50
20	19	17	16	15	14	13	13	-60
24	22	20	19	18	17	16	15	-70
27	25	23	21	20	19	18	17	-80
30	28	26	24	22	21	20	19	-90
34	31	29	27	25	24	23	21	-100
37	34	32	30	28	26	25	23	-110
41	38	35	32	30	29	27	25	-120
44	41	38	35	33	31	29	27	-130
48	44	41	38	35	33	31	29	-140
51	47	44	41	38	36	34	32	-150
54	50	47	44	41	38	36	34	-160
58	54	50	46	43	40	38	36	-170
61	57	53	49	46	43	40	38	-180
64	60	56	52	48	45	42	40	-190
68	63	59	55	51	48	45	42	-200
75	70	65	60	56	52	49	46	-220
82	76	71	66	51	57	53	49	-240
89	83	77	72	67	62	57	52	-260
96	89	83	77	72	67	61	56	-280
103	96	90	83	77	71	65	59	-300
110	103	96	89	82	75	69	63	-320
117	109	102	95	87	80	73	67	-340
124	116	108	100	92	85	78	71	-360
131	123	114	105	97	89	82	75	-380
138	129	120	111	102	94	86	78	-400
145	135	126	116	107	99	90	82	-420
152	142	132	122	112	103	94	85	-440
159	148	138	128	118	108	98	89	-460
166	155	144	133	123	113	103	93	-480
172	161	150	139	128	118	108	98	-500



SHELL, H.E., MK.IIA2  
FUZE, P.D., M51A1  
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PART 2 TABLE C

## TARGET ABOVE GUN - RANGE EFFECTS IN YARDS

Map Range - Yards							Height of Target
4500	5000	5500	6000	6500	7000	7500	Feet
-67	-56	-48	-41	-35	-30	-26	10
-134	-112	-95	-81	-69	-59	-51	20
-200	-168	-142	-121	-103	-88	-76	30
-266	-223	-189	-161	-137	-117	-101	40
-331	-278	-235	-200	-171	-147	-127	50
-396	-332	-281	-239	-205	-176	-152	60
-460	-386	-327	-278	-238	-205	-177	70
-523	-440	-372	-316	-271	-233	-202	80
-586	-493	-417	-355	-304	-262	-227	90
-648	-545	-462	-394	-337	-291	-252	100
-709	-597	-507	-432	-370	-319	-277	110
-770	-649	-551	-470	-403	-347	-301	120
-830	-700	-595	-508	-435	-375	-325	130
-890	-751	-638	-545	-467	-403	-350	140
-949	-801	-681	-582	-499	-431	-374	150
-1008	-851	-724	-619	-531	-458	-398	160
-1066	-901	-767	-656	-563	-486	-422	170
-1123	-950	-809	-692	-595	-514	-447	180
-1181	-999	-851	-729	-627	-542	-471	190
-1238	-1048	-893	-765	-658	-569	-494	200
-1350	-1144	-975	-836	-720	-623	-542	220
-1460	-1239	-1057	-907	-782	-677	-589	240
-1568	-1332	-1138	-977	-843	-731	-636	260
-1674	-1424	-1218	-1047	-904	-784	-682	280
-1778	-1514	-1296	-1115	-964	-836	-728	300
-1881	-1603	-1374	-1183	-1023	-888	-774	320
-1982	-1691	-1451	-1250	-1081	-939	-819	340
-2082	-1778	-1526	-1316	-1140	-991	-865	360
-2180	-1864	-1601	-1382	-1198	-1042	-910	380
-2276	-1948	-1675	-1447	-1255	-1092	-954	400
-2371	-2031	-1748	-1511	-1311	-1142	-998	420
-2465	-2113	-1820	-1574	-1367	-1192	-1042	440
-2558	-2195	-1892	-1638	-1423	-1241	-1086	460
-2649	-2275	-1963	-1701	-1479	-1290	-1130	480
-2738	-2354	-2033	-1763	-1534	-1339	-1173	500

SHELL, H.E., MK.IIA2  
 FUZE, P.D., M51A1  
 MUZZLE VELOCITY, 2770 F/S

PART 2 TABLE C

## TARGET ABOVE GUN - RANGE EFFECTS IN YARDS

Height of Target	Map Range - Yards						
	7500	8000	8500	9000	9500	10000	10500
Feet							
10	-26	-22	-19	-17	-15	-13	-12
20	-51	-44	-39	-34	-30	-27	-24
30	-76	-66	-58	-51	-45	-40	-36
40	-101	-88	-77	-68	-60	-53	-47
50	-127	-110	-96	-85	-75	-66	-59
60	-152	-132	-116	-102	-90	-80	-71
70	-177	-154	-135	-119	-105	-93	-83
80	-202	-176	-154	-135	-120	-107	-95
90	-227	-198	-173	-152	-135	-120	-107
100	-252	-219	-192	-169	-150	-133	-118
110	-277	-241	-211	-186	-165	-146	-130
120	-301	-263	-230	-202	-179	-159	-141
130	-325	-284	-249	-219	-194	-172	-153
140	-350	-305	-267	-235	-208	-185	-165
150	-374	-326	-286	-252	-223	-198	-177
160	-398	-347	-304	-268	-237	-211	-188
170	-422	-368	-323	-285	-252	-224	-200
180	-447	-390	-342	-301	-267	-237	-211
190	-471	-411	-360	-317	-281	-250	-223
200	-494	-432	-379	-334	-296	-263	-234
220	-542	-474	-416	-367	-325	-289	-257
240	-589	-515	-452	-399	-354	-315	-280
260	-636	-556	-488	-431	-382	-340	-303
280	-682	-597	-525	-463	-410	-365	-326
300	-728	-638	-561	-495	-439	-390	-348
320	-774	-678	-597	-527	-467	-415	-371
340	-819	-718	-632	-558	-495	-441	-394
360	-865	-758	-667	-590	-523	-466	-417
380	-910	-798	-702	-621	-551	-491	-439
400	-954	-837	-737	-652	-579	-516	-461
420	-998	-876	-772	-683	-607	-541	-484
440	-1042	-915	-807	-714	-635	-566	-506
460	-1086	-954	-841	-745	-662	-591	-529
480	-1130	-993	-876	-776	-690	-616	-551
500	-1173	-1032	-911	-807	-717	-640	-573

## PART 2 TABLE C

SHELL, H.E., MK.IIA2  
FUZE, P.D., M51A1  
MUZZLE VELOCITY, 2770 F/S

## TARGET ABOVE GUN - RANGE EFFECTS IN YARDS

Map Range - Yards,							Height of Target
11000	11500	12000	12500	13000	13500	14000	Feet
-11	-10	-9	-8	-7	-6	-6	10
-21	-19	-17	-15	-14	-13	-12	20
-32	-29	-26	-23	-21	-19	-17	30
-42	-38	-34	-30	-27	-25	-23	40
-53	-48	-43	-38	-34	-31	-29	50
-63	-57	-51	-45	-41	-38	-35	60
-74	-66	-59	-53	-48	-44	-41	70
-85	-76	-68	-61	-55	-50	-46	80
-96	-86	-77	-69	-62	-56	-52	90
-106	-95	-85	-76	-69	-63	-58	100
-116	-104	-93	-84	-76	-69	-64	110
-126	-113	-101	-91	-83	-76	-70	120
-137	-123	-110	-99	-90	-82	-75	130
-148	-132	-118	-106	-96	-88	-81	140
-158	-141	-126	-113	-103	-94	-87	150
-168	-150	-134	-121	-110	-101	-93	160
-178	-159	-143	-129	-117	-107	-99	170
-188	-168	-151	-137	-124	-113	-104	180
-199	-178	-160	-144	-131	-120	-110	190
-209	-187	-168	-152	-138	-126	-116	200
-229	-205	-185	-167	-152	-139	-127	220
-250	-224	-201	-182	-166	-152	-139	240
-271	-243	-218	-197	-180	-165	-151	260
-291	-261	-235	-213	-194	-177	-162	280
-311	-279	-252	-228	-208	-190	-174	300
-332	-298	-269	-244	-222	-202	-185	320
-353	-317	-286	-259	-235	-214	-196	340
-374	-336	-303	-274	-249	-227	-208	360
-394	-354	-319	-289	-262	-239	-219	380
-414	-372	-336	-304	-276	-251	-230	400
-434	-390	-352	-319	-290	-264	-241	420
-454	-408	-368	-334	-304	-277	-253	440
-474	-426	-385	-349	-317	-289	-265	460
-494	-444	-401	-363	-330	-301	-276	480
-514	-462	-417	-378	-343	-313	-287	500

SHELL, H.E., MK.IIA2  
 FUZE, P.D., M51A1  
 MUZZLE VELOCITY, 2770 F/S

PART 2 TABLE C

## TARGET ABOVE GUN - RANGE EFFECTS IN YARDS

Height of Target	Map Range - Yards						
	14000	14500	15000	15500	16000	16500	17000
10	-6	-5	-5	-5	-4	-4	-4
20	-12	-11	-10	-9	-9	-8	-7
30	-17	-16	-15	-14	-13	-12	-11
40	-23	-21	-20	-19	-17	-16	-15
50	-29	-27	-25	-24	-22	-20	-18
60	-35	-32	-30	-28	-26	-24	-22
70	-41	-38	-35	-32	-30	-28	-26
80	-46	-43	-40	-37	-34	-32	-30
90	-52	-49	-45	-42	-39	-36	-33
100	-58	-54	-50	-46	-43	-40	-37
110	-64	-59	-55	-51	-47	-44	-41
120	-70	-65	-60	-55	-51	-48	-45
130	-75	-70	-65	-60	-56	-52	-48
140	-81	-75	-70	-65	-60	-56	-52
150	-87	-81	-75	-69	-64	-60	-56
160	-93	-86	-79	-73	-68	-63	-59
170	-99	-91	-84	-78	-72	-67	-62
180	-104	-96	-89	-83	-77	-71	-66
190	-110	-102	-94	-87	-81	-75	-70
200	-116	-107	-99	-92	-85	-79	-73
220	-127	-117	-108	-100	-93	-86	-80
240	-139	-128	-118	-109	-101	-94	-87
260	-151	-139	-128	-118	-109	-102	-95
280	-162	-149	-137	-127	-118	-110	-102
300	-174	-160	-147	-136	-126	-117	-109
320	-185	-170	-157	-145	-134	-125	-117
340	-196	-180	-166	-154	-143	-133	-124
360	-208	-191	-176	-163	-151	-141	-132
380	-219	-201	-185	-172	-160	-149	-139
400	-230	-211	-195	-181	-168	-156	-146
420	-241	-222	-205	-190	-176	-164	-153
440	-253	-232	-214	-199	-185	-172	-161
460	-265	-243	-224	-208	-193	-180	-168
480	-276	-254	-234	-217	-202	-188	-175
500	-287	-264	-244	-226	-210	-195	-182

SHELL, H.E., MK.IIA2  
FUZE, P.D., M51A1  
MUZZLE VELOCITY, 2770 F/S

## PART 2 TABLE C

## TARGET ABOVE GUN - RANGE EFFECTS IN YARDS

Map Range - Yards								Height of Target
17500	18000	18500	19000	19500	20000	20500	20900	Feet
-3	-3	-3	-3	-2	-2	-2	-2	10
-7	-6	-6	-5	-5	-5	-5	-5	20
-10	-10	-9	-8	-8	-7	-7	-7	30
-14	-13	-12	-11	-10	-9	-9	-9	40
-17	-16	-15	-14	-13	-12	-11	-11	50
-20	-19	-18	-17	-16	-15	-14	-13	60
-24	-22	-20	-19	-18	-17	-16	-15	70
-28	-26	-23	-21	-20	-19	-18	-17	80
-31	-29	-26	-24	-22	-21	-20	-19	90
-34	-32	-29	-27	-25	-23	-21	-20	100
-38	-35	-32	-29	-27	-25	-23	-21	110
-41	-38	-35	-32	-29	-27	-25	-23	120
-44	-41	-38	-35	-32	-29	-27	-25	130
-48	-44	-41	-38	-35	-32	-29	-27	140
-52	-48	-44	-41	-38	-35	-32	-29	150
-55	-51	-47	-43	-40	-37	-34	-31	160
-58	-54	-50	-46	-42	-39	-36	-33	170
-61	-57	-53	-49	-45	-41	-37	-34	180
-65	-60	-55	-51	-47	-43	-39	-35	190
-68	-63	-58	-54	-50	-45	-40	-36	200
-74	-69	-64	-59	-54	-49	-44	-40	220
-81	-75	-69	-64	-59	-54	-49	-45	240
-88	-81	-75	-69	-64	-59	-54	-49	260
-95	-88	-81	-75	-69	-63	-58	-53	280
-102	-94	-87	-80	-74	-67	-61	-56	300
-109	-101	-93	-86	-79	-72	-65	-59	320
-116	-108	-99	-91	-83	-76	-69	-63	340
-123	-114	-105	-96	-88	-80	-73	-67	360
-129	-120	-111	-102	-93	-85	-77	-71	380
-136	-126	-116	-107	-98	-89	-80	-74	400
-143	-132	-122	-112	-103	-93	-84	-77	420
-150	-139	-128	-117	-107	-97	-87	-80	440
-157	-145	-134	-123	-112	-101	-90	-82	460
-163	-151	-139	-128	-117	-105	-94	-85	480
-169	-157	-145	-133	-121	-109	-97	-87	500



SHELL, H.E., MK.IIA2  
FUZE, P.D., M51A1  
MUZZLE VELOCITY, 2770 F/S

## PART 2 TABLE D

WEIGHT OF PROJECTILE  
EFFECTS IN YARDS OF RANGE DUE TO VARIATIONS IN

Range Yards	Variation in Weight of Projectile - Per Cent										
	-5	-4	-3	-2	-1	0	+1	+2	+3	+4	+5
1000	36	28	21	14	7	0	-7	-13	-20	-26	-32
2000	63	50	37	25	12	0	-12	-23	-35	-47	-58
3000	81	65	48	32	16	0	-16	-31	-46	-62	-77
4000	91	73	54	36	18	0	-18	-36	-53	-71	-88
5000	93	74	55	37	18	0	-18	-37	-55	-73	-91
6000	86	68	51	34	17	0	-17	-35	-52	-69	-86
7000	71	57	43	28	14	0	-15	-30	-44	-59	-74
8000	50	41	31	20	10	0	-11	-22	-33	-44	-56
9000	26	22	17	11	6	0	-6	-12	-19	-26	-34
10000	2	2	2	1	1	0	-1	-2	-4	-7	-10
11000	-22	-17	-13	-9	-4	0	4	7	10	12	14
12000	-46	-36	-27	-18	-9	0	9	17	24	31	37
13000	-69	-55	-41	-27	-14	0	13	25	37	49	60
14000	-93	-74	-55	-36	-18	0	17	34	50	67	83
15000	-117	-93	-69	-45	-22	0	22	43	64	85	105
16000	-142	-113	-84	-55	-27	0	27	53	78	103	128
17000	-168	-133	-99	-65	-32	0	31	62	92	122	151
18000	-196	-155	-115	-76	-37	0	36	72	107	141	175
19000	-226	-179	-133	-88	-43	0	42	83	123	162	201
20000	-260	-206	-153	-101	-50	0	49	97	143	188	232
21000						0	57	113	168	221	273

SHELL, H.E., MK.IIA2  
FUZE, P.D., M51A1  
MUZZLE VELOCITY, 2770 F/S

PART 2 TABLE E

## ROTATION OF THE EARTH, EFFECTS IN YARDS OF RANGE, DUE TO

Latitude 0°

Range Yards	Azimuth of Target - Degrees						
	0 180	15 165	30 150	45 135	60 120	75 105	90 90
1000	0	+3-	+5-	+7-	+9-	+10-	+11-
2000	0	+5-	+10-	+14-	+17-	+19-	+20-
3000	0	+7-	+14-	+20-	+24-	+27-	+28-
4000	0	+9-	+18-	+25-	+30-	+33-	+35-
5000	0	+11-	+20-	+28-	+34-	+38-	+40-
6000	0	+11-	+21-	+30-	+37-	+42-	+44-
7000	0	+12-	+22-	+31-	+39-	+44-	+46-
8000	0	+12-	+23-	+32-	+40-	+45-	+47-
9000	0	+12-	+23-	+33-	+40-	+45-	+47-
10000	0	+12-	+23-	+33-	+40-	+45-	+47-
11000	0	+12-	+23-	+33-	+40-	+45-	+47-
12000	0	+12-	+23-	+33-	+41-	+46-	+48-
13000	0	+12-	+24-	+34-	+42-	+47-	+49-
14000	0	+12-	+24-	+34-	+42-	+47-	+49-
15000	0	+12-	+24-	+35-	+43-	+48-	+50-
16000	0	+13-	+25-	+36-	+44-	+49-	+51-
17000	0	+13-	+26-	+37-	+45-	+50-	+52-
18000	0	+13-	+26-	+37-	+45-	+50-	+52-
19000	0	+13-	+25-	+36-	+44-	+49-	+51-
20000	0	+13-	+25-	+35-	+42-	+47-	+49-
20995	0	+8-	+16-	+23-	+28-	+31-	+32-
	180 360	195 345	210 330	225 315	240 300	255 285	270 270

Azimuth of Target - Degrees

NOTE: For the argument at the top of the tables use the sign that precedes the number; for the argument at the bottom, the sign that follows the number. Azimuth is measured clockwise from the North.

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PART 2 TABLE E

ROTATION OF THE EARTH, EFFECTS IN YARDS OF RANGE, DUE TO

Latitude 10° (North or South)

Range Yards	Azimuth of Target - Degrees						
	0 180	15 165	30 150	45 135	60 120	75 105	90 90
1000	0	+3-	+5-	+7-	+9-	+10-	+11-
2000	0	+5-	+10-	+14-	+17-	+19-	+20-
3000	0	+7-	+14-	+20-	+24-	+27-	+28-
4000	0	+9-	+17-	+24-	+30-	+33-	+34-
5000	0	+10-	+19-	+27-	+34-	+38-	+39-
6000	0	+11-	+21-	+30-	+37-	+41-	+42-
7000	0	+12-	+22-	+31-	+38-	+42-	+44-
8000	0	+12-	+23-	+32-	+39-	+43-	+45-
9000	0	+12-	+23-	+32-	+39-	+44-	+46-
10000	0	+12-	+23-	+33-	+40-	+44-	+46-
11000	0	+12-	+23-	+33-	+40-	+44-	+46-
12000	0	+12-	+23-	+33-	+41-	+45-	+46-
13000	0	+12-	+23-	+33-	+41-	+46-	+47+
14000	0	+12-	+24-	+34-	+41-	+46-	+48-
15000	0	+12-	+24-	+34-	+42-	+47-	+49-
16000	0	+13-	+25-	+35-	+43-	+48-	+50-
17000	0	+13-	+25-	+36-	+44-	+49-	+50-
18000	0	+13-	+25-	+36-	+44-	+49-	+51-
19000	0	+13-	+25-	+35-	+43-	+48-	+50-
20000	0	+12-	+24-	+34-	+42-	+47-	+48-
20995	0	+8-	+16-	+23-	+28-	+31-	+32-
	180 360	195 345	210 330	225 315	240 300	255 285	270 270
	Azimuth of Target - Degrees						

NOTE: For the argument at the top of the tables use the sign that precedes the number; for the argument at the bottom, the sign that follows the number. Azimuth is measured clockwise from the North.

SHELL, H.E., MK.IIA2  
 FUZE, P.D., MELAI  
 MUZZLE VELOCITY, 2770 F/S

PART 2 TABLE E

## ROTATION OF THE EARTH, EFFECTS IN YARDS OF RANGE, DUE TO

Latitude 20° (North or South)

Range Yards	Azimuth of Target - Degrees						
	0 180	15 165	30 150	45 135	60 120	75 105	90 90
1000	0	+3-	+5-	+7-	+8-	+9-	+10-
2000	0	+5-	+9-	+13-	+16-	+18-	+19-
3000	0	+7-	+13-	+18-	+22-	+25-	+27-
4000	0	+8-	+16-	+22-	+27-	+31-	+33-
5000	0	+9-	+18-	+26-	+32-	+36-	+37-
6000	0	+10-	+20-	+29-	+35-	+39-	+40-
7000	0	+11-	+21-	+30-	+37-	+41-	+42-
8000	0	+11-	+21-	+30-	+37-	+42-	+43-
9000	0	+11-	+21-	+30-	+37-	+42-	+44-
10000	0	+12-	+22-	+31-	+38-	+42-	+44-
11000	0	+12-	+22-	+31-	+38-	+42-	+44-
12000	0	+12-	+22-	+31-	+38-	+42-	+44-
13000	0	+12-	+22-	+31-	+38-	+43-	+45-
14000	0	+12-	+23-	+32-	+39-	+44-	+46-
15000	0	+12-	+23-	+33-	+40-	+45-	+47-
16000	0	+12-	+24-	+34-	+41-	+46-	+48-
17000	0	+12-	+24-	+34-	+41-	+46-	+49-
18000	0	+13-	+24-	+34-	+42-	+47-	+49-
19000	0	+13-	+24-	+34-	+41-	+46-	+48-
20000	0	+12-	+23-	+32-	+39-	+44-	+46-
20995	0	+8-	+15-	+21-	+26-	+29-	+31-
	180	195	210	225	240	255	270
	360	345	330	315	300	285	270
	Azimuth of Target - Degrees						

NOTE: For the argument at the top of the tables use the sign that precedes the number; for the argument at the bottom, the sign that follows the number. Azimuth is measured clockwise from the North.

SHELL, H.E., MK.IIA2  
FUZE, P.D., M51A1  
MUZZLE VELOCITY, 2770 F/S

## PART 2 TABLE E

## ROTATION OF THE EARTH, EFFECTS IN YARDS OF RANGE, DUE TO

Latitude 30° (North or South)

Range Yards	Azimuth of Target - Degrees						
	0 180	15 165	30 150	45 135	60 120	75 105	90 90
1000	0	+2-	+4-	+6-	+8-	+9-	+9-
2000	0	+4-	+8-	+12-	+15-	+17-	+17-
3000	0	+6-	+12-	+17-	+21-	+24-	+24-
4000	0	+8-	+15-	+21-	+26-	+29-	+30-
5000	0	+9-	+17-	+24-	+30-	+33-	+34-
6000	0	+9-	+18-	+26-	+32-	+36-	+37-
7000	0	+10-	+19-	+27-	+33-	+37-	+39-
8000	0	+10-	+20-	+28-	+34-	+38-	+40-
9000	0	+10-	+20-	+29-	+35-	+39-	+40-
10000	0	+10-	+20-	+29-	+35-	+39-	+40-
11000	0	+10-	+20-	+29-	+35-	+39-	+40-
12000	0	+10-	+20-	+29-	+35-	+39-	+41-
13000	0	+10-	+20-	+29-	+35-	+39-	+42-
14000	0	+11-	+21-	+30-	+36-	+40-	+42-
15000	0	+11-	+21-	+30-	+37-	+41-	+43-
16000	0	+11-	+22-	+31-	+38-	+42-	+44-
17000	0	+11-	+22-	+32-	+39-	+43-	+45-
18000	0	+12-	+23-	+32-	+39-	+43-	+45-
19000	0	+12-	+22-	+31-	+38-	+42-	+44-
20000	0	+11-	+21-	+30-	+37-	+41-	+42-
20995	0	+7-	+14-	+20-	+24-	+27-	+28-
	180	195	210	225	240	255	270
	360	345	330	315	300	285	270
	Azimuth of Target - Degrees						

NOTE: For the argument at the top of the tables use the sign that precedes the number; for the argument at the bottom, the sign that follows the number. Azimuth is measured clockwise from the North.

SHELL, H.E., MK.IIA2  
 FUZE, P.D., M51A1  
 MUZZLE VELOCITY, 2770 F/S

PART 2 TABLE E

## ROTATION OF THE EARTH, EFFECTS IN YARDS OF RANGE, DUE TO

Latitude 40° (North or South)

Range Yards	Azimuth of Target - Degrees						
	0 180	15 165	30 150	45 135	60 120	75 105	90 90
1000	0	+2-	+4-	+6-	+7-	+7-	+8-
2000	0	+4-	+8-	+11-	+13-	+14-	+15-
3000	0	+6-	+11-	+15-	+18-	+20-	+21-
4000	0	+7-	+13-	+18-	+22-	+25-	+27-
5000	0	+8-	+15-	+21-	+26-	+29-	+31-
6000	0	+8-	+16-	+23-	+29-	+32-	+33-
7000	0	+9-	+17-	+24-	+30-	+33-	+34-
8000	0	+9-	+17-	+24-	+30-	+34-	+35-
9000	0	+10-	+18-	+25-	+30-	+34-	+36-
10000	0	+10-	+18-	+25-	+30-	+34-	+36-
11000	0	+10-	+18-	+25-	+30-	+34-	+36-
12000	0	+10-	+18-	+25-	+31-	+35-	+36-
13000	0	+10-	+19-	+26-	+32-	+36-	+37-
14000	0	+10-	+19-	+26-	+32-	+36-	+37-
15000	0	+10-	+19-	+27-	+33-	+36-	+38-
16000	0	+10-	+19-	+27-	+33-	+37-	+39-
17000	0	+10-	+19-	+27-	+34-	+38-	+39-
18000	0	+10-	+19-	+27-	+34-	+38-	+40-
19000	0	+10-	+19-	+27-	+33-	+37-	+39-
20000	0	+10-	+19-	+26-	+32-	+36-	+37-
20995	0	+6-	+12-	+18-	+22-	+24-	+25-
	180 360	195 345	210 330	225 315	240 300	255 285	270 270

Azimuth of Target - Degrees

NOTE: For the argument at the top of the tables use the sign that precedes the number; for the argument at the bottom, the sign that follows the number. Azimuth is measured clockwise from the North.

PART 2 TABLE E

ROTATION OF THE EARTH, EFFECTS IN YARDS OF RANGE, DUE TO

Latitude 50° (North or South)

Range Yards	Azimuth of Target - Degrees						
	0 180	15 165	30 150	45 135	60 120	75 105	90 90
1000	0	+2-	+4-	+5-	+6-	+6-	+7-
2000	0	+4-	+7-	+9-	+11-	+12-	+13-
3000	0	+5-	+9-	+12-	+15-	+17-	+18-
4000	0	+6-	+11-	+15-	+19-	+21-	+22-
5000	0	+7-	+13-	+18-	+22-	+24-	+25-
6000	0	+7-	+14-	+20-	+24-	+26-	+27-
7000	0	+8-	+15-	+21-	+25-	+27-	+28-
8000	0	+8-	+15-	+21-	+25-	+28-	+29-
9000	0	+8-	+15-	+21-	+25-	+28-	+30-
10000	0	+8-	+15-	+21-	+26-	+29-	+30-
11000	0	+8-	+15-	+21-	+26-	+29-	+30-
12000	0	+8-	+15-	+21-	+26-	+29-	+30-
13000	0	+8-	+15-	+21-	+26-	+29-	+30-
14000	0	+8-	+16-	+22-	+27-	+30-	+31-
15000	0	+8-	+16-	+22-	+27-	+30-	+32-
16000	0	+8-	+16-	+23-	+28-	+31-	+33-
17000	0	+8-	+16-	+23-	+29-	+32-	+33-
18000	0	+9-	+17-	+24-	+29-	+32-	+33-
19000	0	+9-	+17-	+23-	+28-	+31-	+32-
20000	0	+8-	+16-	+22-	+27-	+30-	+31-
20995	0	+5-	+10-	+14-	+17-	+19-	+21-
	180	195	210	225	240	255	270
	360	345	330	315	300	285	270

Azimuth of Target - Degrees

NOTE: For the argument at the top of the tables use the sign that precedes the number; for the argument at the bottom, the sign that follows the number. Azimuth is measured clockwise from the North.

SHELL, H.E., MK.IIA2  
 FUZE, P.D., M51A1  
 MUZZLE VELOCITY, 2770 F/S

PART 2 TABLE E

## ROTATION OF THE EARTH, EFFECTS IN YARDS OF RANGE, DUE TO

Latitude 60° (North or South)

Range Yards	Azimuth of Target - Degrees						
	0 180	15 165	30 150	45 135	60 120	75 105	90 90
1000	0	+2-	+3-	+4-	+5-	+5-	+5-
2000	0	+3-	+5-	+7-	+9-	+10-	+10-
3000	0	+4-	+7-	+10-	+12-	+14-	+14-
4000	0	+5-	+9-	+12-	+15-	+17-	+18-
5000	0	+5-	+10-	+14-	+17-	+19-	+20-
6000	0	+6-	+11-	+15-	+19-	+21-	+21-
7000	0	+6-	+11-	+16-	+20-	+22-	+22-
8000	0	+6-	+11-	+16-	+20-	+22-	+23-
9000	0	+6-	+11-	+16-	+20-	+22-	+23-
10000	0	+6-	+11-	+16-	+20-	+22-	+23-
11000	0	+6-	+11-	+16-	+20-	+22-	+23-
12000	0	+6-	+12-	+17-	+21-	+23-	+23-
13000	0	+6-	+12-	+17-	+21-	+23-	+24-
14000	0	+6-	+12-	+17-	+21-	+23-	+24-
15000	0	+6-	+12-	+17-	+21-	+23-	+24-
16000	0	+7-	+13-	+18-	+22-	+24-	+25-
17000	0	+7-	+13-	+18-	+22-	+25-	+26-
18000	0	+7-	+13-	+18-	+22-	+25-	+26-
19000	0	+7-	+13-	+18-	+22-	+24-	+25-
20000	0	+6-	+12-	+17-	+21-	+24-	+25-
20995	0	+4-	+8-	+11-	+14-	+16-	+16-
	180	195	210	225	240	255	270
	360	345	330	315	300	285	270
	Azimuth of Target - Degrees						

NOTE: For the argument at the top of the tables use the sign that precedes the number; for the argument at the bottom, the sign that follows the number. Azimuth is measured clockwise from the North.

SHELL, H.E., MK.IIA2  
 FUZE, P.D., M51A1  
 MUZZLE VELOCITY, 2770 F/S

PART 2 TABLE E

ROTATION OF THE EARTH, EFFECTS IN YARDS OF RANGE, DUE TO

Latitude 70° (North or South)							
Range Yards	Azimuth of Target - Degrees						
	0 180	15 165	30 150	45 135	60 120	75 105	90 90
1000	0	+1-	+2-	+3-	+3-	+4-	+4-
2000	0	+2-	+4-	+5-	+6-	+7-	+7-
3000	0	+3-	+5-	+7-	+8-	+9-	+10-
4000	0	+3-	+6-	+8-	+10-	+11-	+12-
5000	0	+4-	+7-	+9-	+11-	+13-	+14-
6000	0	+4-	+7-	+10-	+12-	+14-	+15-
7000	0	+4-	+8-	+11-	+13-	+15-	+16-
8000	0	+4-	+8-	+11-	+13-	+15-	+16-
9000	0	+4-	+8-	+11-	+13-	+15-	+16-
10000	0	+4-	+8-	+11-	+13-	+15-	+16-
11000	0	+4-	+8-	+11-	+13-	+15-	+16-
12000	0	+4-	+8-	+11-	+14-	+16-	+16-
13000	0	+4-	+8-	+11-	+14-	+16-	+16-
14000	0	+4-	+8-	+11-	+14-	+16-	+17-
15000	0	+4-	+8-	+11-	+14-	+16-	+17-
16000	0	+4-	+8-	+12-	+15-	+17-	+17-
17000	0	+5-	+9-	+12-	+15-	+17-	+17-
18000	0	+5-	+9-	+12-	+15-	+17-	+18-
19000	0	+5-	+9-	+12-	+15-	+17-	+18-
20000	0	+4-	+8-	+11-	+14-	+16-	+17-
20995	0	+3-	+6-	+8-	+10-	+11-	+11-
	180	195	210	225	240	255	270
	360	345	330	315	300	285	270
Azimuth of Target - Degrees							

NOTE: For the argument at the top of the tables use the sign that precedes the number; for the argument at the bottom, the sign that follows the number. Azimuth is measured clockwise from the North.



## PART 2 TABLE Fa

SHELL, H.E., MK.IIA2  
 FUZE, P.D., M51A1  
 MUZZLE VELOCITY, 2770 F/S

MUZZLE VELOCITY, EFFECTS IN YARDS OF RANGE, DUE TO INCREASE IN

Increase in Muzzle Velocity - Feet Per Second							Range
90	100	110	120	130	140	150	Yards
60	66	72	78	85	91	97	1000
117	129	141	153	166	178	190	2000
171	189	206	224	242	260	278	3000
221	244	267	290	314	337	360	4000
267	295	323	351	380	408	436	5000
308	341	374	407	440	473	505	6000
344	382	419	457	494	530	566	7000
376	417	458	499	540	580	619	8000
404	448	491	535	578	622	665	9000
429	475	520	566	612	659	706	10000
451	500	548	596	645	694	744	11000
474	525	576	627	678	729	781	12000
497	551	604	657	711	765	818	13000
520	576	632	688	744	800	856	14000
543	601	660	719	778	836	894	15000
566	627	689	751	812	872	932	16000
590	654	719	783	846	909	971	17000
617	684	751	817	883	948	1013	18000
649	719	788	857	925	993	1060	19000
689	762	834	906	977	1047	1116	20000
742	819	895	969	1042	1114	1186	21000
			1053	1129	1204	1278	22000

SHELL, H.E., MK.IIA2  
 FUZE, P.D., M51A1  
 MUZZLE VELOCITY, 2770 F/S

PART 2 TABLE Fb

MUZZLE VELOCITY, EFFECTS IN YARDS OF RANGE, DUE TO DECREASE IN

Range Yards	Decrease in Muzzle Velocity - Feet Per Second							
	10	20	30	40	50	60	70	80
1000	-7	-14	-21	-28	-35	-42	-49	-57
2000	-13	-27	-41	-55	-68	-82	-96	-111
3000	-19	-39	-59	-80	-100	-120	-140	-161
4000	-25	-50	-76	-103	-129	-155	-181	-208
5000	-30	-61	-92	-124	-155	-187	-219	-251
6000	-35	-71	-106	-142	-178	-215	-252	-289
7000	-39	-79	-118	-158	-198	-239	-280	-321
8000	-43	-86	-129	-172	-216	-260	-304	-348
9000	-46	-92	-138	-184	-231	-278	-325	-372
10000	-49	-98	-146	-195	-244	-294	-344	-393
11000	-52	-103	-154	-206	-257	-309	-362	-414
12000	-54	-108	-162	-216	-270	-325	-380	-435
13000	-56	-113	-170	-226	-283	-340	-398	-456
14000	-59	-118	-177	-236	-296	-356	-416	-476
15000	-62	-123	-184	-246	-309	-372	-434	-497
16000	-64	-128	-192	-257	-322	-388	-453	-518
17000	-67	-133	-200	-268	-336	-405	-473	-541
18000	-70	-140	-211	-282	-354	-426	-498	-570
19000	-74	-149	-225	-301	-377	-454	-531	-609
20000	-80	-161	-243	-325	-408	-491	-575	-660

SHELL, H.E., MK.IIA2  
FUZE, P.D., M51A1  
MUZZLE VELOCITY, 2770 F/S

## PART 2 TABLE Fb

MUZZLE VELOCITY, EFFECTS IN YARDS OF RANGE, DUE TO DECREASE IN

Decrease in Muzzle Velocity - Feet Per Second							Range Yards
90	100	110	120	130	140	150	
-65	-72	-80	-88	-95	-102	-110	1000
-126	-140	-155	-170	-185	-200	-215	2000
-183	-204	-225	-247	-269	-291	-313	3000
-236	-263	-290	-318	-346	-374	-403	4000
-283	-316	-349	-382	-415	-449	-483	5000
-325	-362	-400	-438	-476	-514	-552	6000
-361	-402	-444	-486	-527	-569	-611	7000
-392	-436	-481	-526	-571	-616	-661	8000
-419	-466	-514	-561	-609	-657	-705	9000
-443	-493	-544	-594	-644	-695	-746	10000
-467	-520	-573	-626	-679	-732	-786	11000
-491	-546	-602	-657	-713	-769	-825	12000
-514	-572	-630	-688	-746	-805	-864	13000
-537	-598	-658	-719	-779	-840	-902	14000
-560	-623	-686	-750	-813	-876	-940	15000
-584	-649	-715	-782	-848	-914	-981	16000
-610	-679	-748	-818	-888	-958	-1028	17000
-643	-716	-790	-864	-938	-1013	-1087	18000
-687	-766	-846	-926	-1005	-1085	-1166	19000
-746	-833	-921					20000



SHELL, H.E., MK.IIA2  
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MUZZLE VELOCITY, 2770 F/S

## PART 2 TABLE Ga

AIR DENSITY, EFFECTS IN YARDS OF RANGE, DUE TO DECREASE IN

Decrease in Air Density - Per Cent								Range
9	10	11	12	13	14	15	16	Yards
5	5	6	6	7	7	8	9	1000
19	21	23	25	27	29	31	34	2000
42	47	51	56	61	65	70	75	3000
74	83	91	99	108	116	124	132	4000
116	129	142	155	168	181	193	205	5000
167	185	204	222	240	258	275	292	6000
227	251	276	300	323	347	370	392	7000
293	324	355	386	416	446	476	505	8000
362	400	439	477	515	552	589	627	9000
431	477	524	570	616	661	706	752	10000
500	554	609	663	717	771	824	877	11000
568	630	693	755	817	879	940	1001	12000
635	705	775	845	915	985	1054	1123	13000
701	779	856	934	1011	1089	1166	1243	14000
766	852	937	1022	1106	1191	1276	1361	15000
831	924	1017	1109	1200	1292	1384	1476	16000
898	997	1097	1196	1294	1392	1491	1589	17000
968	1074	1180	1285	1390	1495	1599	1703	18000
1044	1157	1269	1380	1492	1603	1713	1823	19000
1128	1249	1368	1487	1605	1722	1839	1955	20000
1227	1357	1485	1612	1738	1862	1985	2107	21000
1352	1492	1630	1766	1900	2031	2160	2287	22000
				2103	2240	2374	2504	23000

SHELL, H.E., MK. IIA2  
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 MUZZLE VELOCITY, 2770 F/S

PART 2 TABLE Gb

## AIR DENSITY, EFFECTS IN YARDS OF RANGE, DUE TO INCREASE IN

Range Yards	Increase in Air Density - Per Cent							
	1	2	3	4	5	6	7	8
1000	-1	-1	-2	-3	-4	-4	-4	-5
2000	-2	-4	-6	-9	-11	-13	-15	-17
3000	-4	-9	-14	-19	-23	-28	-33	-38
4000	-8	-17	-25	-34	-42	-51	-60	-69
5000	-13	-27	-40	-54	-67	-81	-95	-109
6000	-19	-39	-58	-78	-98	-118	-138	-158
7000	-26	-53	-79	-106	-133	-160	-187	-215
8000	-34	-68	-102	-136	-170	-205	-240	-275
9000	-41	-83	-125	-166	-208	-251	-293	-335
10000	-49	-98	-147	-196	-245	-295	-345	-394
11000	-56	-113	-169	-226	-282	-339	-395	-452
12000	-64	-127	-191	-255	-318	-382	-445	-509
13000	-71	-142	-212	-283	-354	-424	-495	-565
14000	-78	-156	-233	-311	-389	-466	-544	-621
15000	-85	-170	-255	-340	-425	-510	-595	-680
16000	-93	-185	-278	-371	-464	-557	-650	-743
17000	-101	-202	-303	-404	-505	-607	-709	-811
18000	-110	-220	-330	-441	-552	-663	-775	-888
19000	-120	-240	-361	-483	-606	-730	-856	-984
20000	-132	-266	-402	-540	-681	-825	-970	



SHELL, H.E., MK. IIA2  
 FUZE, P.D., M51A1  
 MUZZLE VELOCITY, 2770 F/S

PART 2 TABLE H

## TEMPERATURE (ELASTICITY), EFFECTS IN YARDS OF RANGE

Range Yards	Temperature of Air - Degrees Fahrenheit											
	0	10	20	30	40	50	59	60	70	80	90	100
1000	13	11	8	6	4	2	0	0	-2	-4	-6	-8
2000	26	22	17	13	8	4	0	0	-4	-8	-12	-16
3000	41	34	27	20	13	6	0	-1	-7	-13	-19	-25
4000	59	48	38	28	18	8	0	-1	-10	-18	-27	-35
5000	80	65	51	37	24	11	0	-1	-13	-24	-36	-47
6000	104	85	66	48	31	14	0	-2	-17	-31	-46	-60
7000	131	108	84	61	39	18	0	-2	-21	-40	-58	-75
8000	161	132	103	75	48	22	0	-2	-26	-49	-71	-91
9000	190	155	121	88	56	26	0	-3	-31	-57	-83	-107
10000	211	172	134	97	62	29	0	-3	-34	-63	-91	-118
11000	220	179	139	101	65	30	0	-3	-35	-65	-93	-120
12000	217	176	136	99	63	29	0	-3	-34	-63	-89	-113
13000	206	166	128	92	58	27	0	-3	-31	-57	-80	-100
14000	192	154	118	84	53	24	0	-3	-28	-50	-69	-86
15000	179	143	109	77	48	22	0	-2	-24	-43	-59	-73
16000	167	132	100	70	43	19	0	-2	-21	-37	-50	-61
17000	154	121	91	64	39	17	0	-2	-18	-32	-43	-51
18000	141	111	83	58	35	15	0	-2	-16	-28	-37	-44
19000	131	103	77	53	32	14	0	-2	-15	-25	-33	-39
20000	127	99	74	51	31	14	0	-1	-14	-24	-32	-37
21000	129	100	75	52	32	15	0					

SHELL, H.E., MK. IIA2  
FUZE, P.D., M51A1  
MUZZLE VELOCITY, 2770 F/S

PART 2 TABLE Ia

## REAR WIND, EFFECTS IN YARDS OF RANGE, DUE TO

Range Yards	Rear Wind - Miles Per Hour									
	5	10	15	20	25	30	35	40	45	50
1000	0	0	0	1	1	1	1	1	1	1
2000	1	1	2	3	4	4	4	5	4	4
3000	2	3	5	7	8	9	10	11	11	11
4000	3	6	9	12	14	16	18	20	22	23
5000	4	9	14	18	22	26	30	34	37	40
6000	6	13	20	26	33	39	46	52	57	62
7000	9	18	28	37	47	56	66	75	83	91
8000	13	25	38	51	65	78	91	103	115	126
9000	17	34	51	69	87	104	121	137	153	168
10000	22	45	67	90	113	135	156	177	197	216
11000	28	57	85	114	142	170	196	222	247	270
12000	35	70	105	140	174	207	240	272	302	331
13000	43	85	127	168	209	249	288	326	363	399
14000	51	101	151	200	248	295	341	386	430	473
15000	60	119	177	235	291	346	400	452	503	554
16000	70	138	205	272	337	401	463	523	582	641
17000	80	159	236	312	386	459	530	598	665	732
18000	91	181	269	355	439	521	600	677	752	826
19000	104	206	305	401	495	586	674	760	843	924
20000	118	233	344	451	555	656	754	848	939	1027
21000	133	262	386	506	622	734	841	944	1043	1138
22000								1059	1168	1273

SHELL, H.E., MK.IIA2  
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PART 2 TABLE 1b

## HEAD WIND, EFFECTS IN YARDS OF RANGE, DUE TO

Range Yards	Head Wind - Miles Per Hour									
	5	10	15	20	25	30	35	40	45	50
1000	0	0	0	-1	-1	-1	-1	-1	-1	-2
2000	-1	-1	-2	-3	-3	-4	-4	-4	-4	-4
3000	-2	-3	-5	-6	-7	-8	-9	-9	-9	-9
4000	-3	-5	-8	-10	-12	-14	-16	-17	-18	-19
5000	-4	-8	-12	-16	-20	-24	-27	-30	-34	-37
6000	-6	-12	-19	-25	-31	-37	-43	-50	-57	-64
7000	-9	-18	-28	-37	-46	-55	-65	-76	-88	-100
8000	-13	-26	-39	-52	-65	-79	-93	-109	-126	-144
9000	-18	-35	-53	-71	-89	-108	-128	-149	-172	-196
10000	-23	-46	-69	-93	-117	-142	-168	-195	-224	-254
11000	-29	-58	-88	-118	-149	-181	-213	-246	-281	-318
12000	-36	-72	-109	-147	-185	-224	-264	-304	-346	-390
13000	-44	-88	-133	-179	-225	-273	-321	-370	-420	-472
14000	-52	-105	-159	-214	-270	-327	-385	-444	-504	-566
15000	-61	-124	-188	-253	-319	-386	-455	-525	-597	-671
16000	-71	-144	-219	-295	-372	-451	-531	-613	-697	-784
17000	-82	-166	-252	-340	-429	-520	-613	-708	-805	-905
18000	-94	-190	-288	-389	-491	-595	-702	-811	-922	-1035
19000	-107	-216	-328	-443	-560	-679	-801	-925	-1052	-1181
20000	-121	-245	-372	-503	-637	-774	-915			

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PART 2 TABLE J

## CROSS WIND EFFECTS

Range Yards	In Mils					In Degrees				
	Cross Wind - Miles Per Hour									
	10	20	30	40	50	10	20	30	40	50
1000	0.2	0.4	0.7	0.9	1.1	0.01	0.02	0.03	0.05	0.06
2000	0.5	0.9	1.4	1.9	2.3	0.03	0.05	0.07	0.10	0.13
3000	0.8	1.5	2.2	3.0	3.7	0.04	0.08	0.12	0.16	0.21
4000	1.1	2.1	3.2	4.2	5.3	0.06	0.12	0.18	0.23	0.29
5000	1.4	2.8	4.2	5.6	7.0	0.08	0.16	0.24	0.31	0.39
6000	1.8	3.6	5.3	7.1	8.9	0.10	0.20	0.30	0.40	0.50
7000	2.2	4.4	6.6	8.8	11.0	0.12	0.24	0.37	0.50	0.62
8000	2.6	5.3	8.0	10.7	13.3	0.14	0.29	0.45	0.60	0.75
9000	3.1	6.3	9.4	12.6	15.7	0.17	0.35	0.53	0.71	0.88
10000	3.6	7.3	10.9	14.6	18.2	0.20	0.41	0.61	0.82	1.02
11000	4.1	8.3	12.4	16.6	20.7	0.23	0.47	0.70	0.93	1.16
12000	4.6	9.3	13.9	18.5	23.1	0.26	0.52	0.78	1.04	1.30
13000	5.1	10.2	15.3	20.4	25.5	0.29	0.57	0.86	1.15	1.43
14000	5.6	11.1	16.7	22.3	27.8	0.32	0.63	0.94	1.25	1.56
15000	6.0	12.0	18.1	24.1	30.1	0.34	0.68	1.02	1.35	1.69
16000	6.4	12.9	19.4	25.9	32.3	0.36	0.73	1.09	1.45	1.82
17000	6.9	13.8	20.7	27.6	34.5	0.39	0.78	1.16	1.55	1.94
18000	7.3	14.7	22.0	29.4	36.7	0.41	0.83	1.24	1.65	2.06
19000	7.8	15.7	23.5	31.3	39.1	0.44	0.88	1.32	1.76	2.19
20000	8.4	16.8	25.2	33.6	42.0	0.47	0.95	1.42	1.89	2.36
20995	9.8	19.6	29.3	39.1	48.9	0.55	1.10	1.65	2.20	2.75

SHELL, H.E., MK.IIA2  
 FUZE, P.D., M51A1  
 MUZZLE VELOCITY, 2770 F/S

PART 2 TABLE K

## ROTATION OF THE EARTH, DEFLECTION EFFECTS IN MILS, DUE TO

Latitude 0°

Range Yards	Azimuth of Target - Degrees						
	0 360	30 330	60 300	90 270	120 240	150 210	180 180
1000	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2000	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3000	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4000	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5000	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6000	0.0	0.0	0.0	0.0	0.0	0.0	0.0
7000	0.0	0.0	0.0	0.0	0.0	0.0	0.0
8000	0.0	0.0	0.0	0.0	0.0	0.0	0.0
9000	0.0	0.0	0.0	0.0	0.0	0.0	0.0
10000	0.0	0.0	0.0	0.0	0.0	0.0	0.0
11000	0.0	0.0	0.0	0.0	0.0	0.0	0.0
12000	+0.1-	+0.1-	0.0	0.0	0.0	-0.1+	-0.1+
13000	+0.2-	+0.1-	0.0	0.0	0.0	-0.1+	-0.2+
14000	+0.2-	+0.1-	+0.1-	0.0	-0.1+	-0.1+	-0.2+
15000	+0.2-	+0.2-	+0.1-	0.0	-0.1+	-0.2+	-0.2+
16000	+0.3-	+0.2-	+0.1-	0.0	-0.1+	-0.2+	-0.3+
17000	+0.4-	+0.3-	+0.1-	0.0	-0.1+	-0.3+	-0.4+
18000	+0.5-	+0.4-	+0.2-	0.0	-0.2+	-0.4+	-0.5+
19000	+0.6-	+0.5-	+0.3-	0.0	-0.3+	-0.5+	-0.6+
20000	+0.8-	+0.7-	+0.4-	0.0	-0.4+	-0.7+	-0.8+
20995	+1.5-	+1.3-	+0.8-	0.0	-0.8+	-1.3+	-1.5+
	180 180	150 210	120 240	90 270	60 300	30 330	0 360

Azimuth of Target - Degrees

Latitude 0°

NOTE: A negative sign means that the effect is to the right; a positive sign, to the left. For the argument at the top of the tables, use the sign that precedes the number; for the argument at the bottom, the sign that follows the number. Azimuth is measured clockwise from the North.

PART 2 TABLE K

ROTATION OF THE EARTH, DEFLECTION EFFECTS IN MILS, DUE TO

Latitude 10° (North)

Range Yards	Azimuth of Target - Degrees						
	0 360	30 330	60 300	90 270	120 240	150 210	180 180
1000	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2000	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3000	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4000	-0.1+	-0.1+	-0.1+	-0.1+	-0.1+	-0.1+	-0.1+
5000	-0.1+	-0.1+	-0.1+	-0.1+	-0.1+	-0.1+	-0.1+
6000	-0.1+	-0.1+	-0.1+	-0.1+	-0.1+	-0.1+	-0.1+
7000	-0.1+	-0.1+	-0.1+	-0.1+	-0.1+	-0.1+	-0.1+
8000	-0.1+	-0.1+	-0.1+	-0.1+	-0.2+	-0.2+	-0.2+
9000	-0.1+	-0.1+	-0.1+	-0.2+	-0.2+	-0.2+	-0.2+
10000	-0.2+	-0.2+	-0.2+	-0.2+	-0.2+	-0.2+	-0.2+
11000	-0.2+	-0.2+	-0.2+	-0.2+	-0.3+	-0.3+	-0.3+
12000	-0.2+	-0.2+	-0.2+	-0.2+	-0.3+	-0.3+	-0.3+
13000	-0.2+	-0.2+	-0.2+	-0.3+	-0.3+	-0.4+	-0.4+
14000	-0.2+	-0.2+	-0.3+	-0.3+	-0.4+	-0.5+	-0.5+
15000	-0.2+	-0.2+	-0.3+	-0.3+	-0.4+	-0.5+	-0.6+
16000	-0.1+	-0.2+	-0.3+	-0.4+	-0.5+	-0.6+	-0.7+
17000	-0.1+	-0.2+	-0.3+	-0.5+	-0.6+	-0.7+	-0.8+
18000	0.0	-0.1+	-0.3+	-0.4+	-0.7+	-0.9+	-1.0+
19000	+0.1-	-0.1+	-0.3+	-0.6+	-0.9+	-1.1+	-1.2+
20000	+0.2-	+0.1-	-0.2+	-0.6+	-1.0+	-1.3+	-1.5+
20995	+0.7-	+0.4-	-0.1+	-0.8+	-1.5+	-2.0+	-2.2+
	180 180	150 210	120 240	90 270	60 300	30 330	0 360

Azimuth of Target - Degrees

Latitude 10° (South)

NOTE: A negative sign means that the effect is to the right; a positive sign, to the left. For the argument at the top of the tables, use the sign that precedes the number; for the argument at the bottom, the sign that follows the number. Azimuth is measured clockwise from the North.

SHELL, H.E., MK.IIA2  
 FUZE, P.D., M51A1  
 MUZZLE VELOCITY, 2770 F/S

PART 2 TABLE K

## ROTATION OF THE EARTH, DEFLECTION EFFECTS IN MILS, DUE TO

Latitude 20° (North)

Range Yards	Azimuth of Target - Degrees						
	0 360	30 330	60 300	90 270	120 240	150 210	180 180
1000	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2000	-0.1+	-0.1+	-0.1+	-0.1+	-0.1+	-0.1+	-0.1+
3000	-0.1+	-0.1+	-0.1+	-0.1+	-0.1+	-0.1+	-0.1+
4000	-0.1+	-0.1+	-0.1+	-0.1+	-0.1+	-0.1+	-0.1+
5000	-0.2+	-0.2+	-0.2+	-0.2+	-0.2+	-0.2+	-0.2+
6000	-0.2+	-0.2+	-0.2+	-0.2+	-0.2+	-0.2+	-0.2+
7000	-0.2+	-0.2+	-0.2+	-0.2+	-0.2+	-0.2+	-0.2+
8000	-0.3+	-0.3+	-0.3+	-0.3+	-0.3+	-0.3+	-0.3+
9000	-0.3+	-0.3+	-0.3+	-0.3+	-0.3+	-0.3+	-0.3+
10000	-0.3+	-0.4+	-0.4+	-0.4+	-0.4+	-0.4+	-0.4+
11000	-0.4+	-0.4+	-0.4+	-0.4+	-0.5+	-0.5+	-0.5+
12000	-0.4+	-0.4+	-0.5+	-0.5+	-0.6+	-0.6+	-0.6+
13000	-0.4+	-0.5+	-0.5+	-0.6+	-0.6+	-0.7+	-0.7+
14000	-0.5+	-0.5+	-0.6+	-0.7+	-0.7+	-0.8+	-0.8+
15000	-0.5+	-0.6+	-0.7+	-0.8+	-0.8+	-0.9+	-0.9+
16000	-0.5+	-0.6+	-0.7+	-0.8+	-0.9+	-1.0+	-1.1+
17000	-0.6+	-0.7+	-0.8+	-0.9+	-1.0+	-1.2+	-1.3+
18000	-0.6+	-0.7+	-0.8+	-1.0+	-1.2+	-1.4+	-1.5+
19000	-0.6+	-0.7+	-0.9+	-1.1+	-1.4+	-1.6+	-1.8+
20000	-0.5+	-0.6+	-0.9+	-1.3+	-1.7+	-2.0+	-2.1+
20995	-0.1+	-0.3+	-0.9+	-1.6+	-2.3+	-2.8+	-3.0+
	180 180	150 210	120 240	90 270	60 300	30 330	0 360

Azimuth of Target - Degrees

Latitude 20° (South)

NOTE: A negative sign means that the effect is to the right; a positive sign, to the left. For the argument at the top of the tables, use the sign that precedes the number; for the argument at the bottom, the sign that follows the number. Azimuth is measured clockwise from the North.

## PART 2 TABLE K

SHELL, H.E., MK. IIA2  
FUZE, P.D., M51A1  
MUZZLE VELOCITY, 2770 F/S

## ROTATION OF THE EARTH, DEFLECTION EFFECTS IN MILS, DUE TO

## Latitude 30° (North)

Range Yards	Azimuth of Target - Degrees						
	0 360	30 330	60 300	90 270	120 240	150 210	180 180
1000	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2000	-0.1+	-0.1+	-0.1+	-0.1+	-0.1+	-0.1+	-0.1+
3000	-0.1+	-0.1+	-0.1+	-0.1+	-0.1+	-0.1+	-0.1+
4000	-0.2+	-0.2+	-0.2+	-0.2+	-0.2+	-0.2+	-0.2+
5000	-0.2+	-0.2+	-0.2+	-0.2+	-0.2+	-0.2+	-0.2+
6000	-0.3+	-0.3+	-0.3+	-0.3+	-0.3+	-0.3+	-0.3+
7000	-0.3+	-0.3+	-0.3+	-0.3+	-0.3+	-0.3+	-0.3+
8000	-0.4+	-0.4+	-0.4+	-0.4+	-0.4+	-0.4+	-0.4+
9000	-0.4+	-0.4+	-0.4+	-0.5+	-0.5+	-0.5+	-0.5+
10000	-0.5+	-0.5+	-0.5+	-0.6+	-0.6+	-0.6+	-0.6+
11000	-0.6+	-0.6+	-0.6+	-0.6+	-0.7+	-0.7+	-0.7+
12000	-0.7+	-0.7+	-0.7+	-0.7+	-0.8+	-0.8+	-0.8+
13000	-0.8+	-0.8+	-0.8+	-0.8+	-0.9+	-0.9+	-0.9+
14000	-0.8+	-0.8+	-0.9+	-1.0+	-1.0+	-1.0+	-1.0+
15000	-0.9+	-0.9+	-1.0+	-1.1+	-1.1+	-1.2+	-1.2+
16000	-1.0+	-1.0+	-1.1+	-1.2+	-1.3+	-1.4+	-1.4+
17000	-1.1+	-1.1+	-1.2+	-1.3+	-1.5+	-1.6+	-1.6+
18000	-1.1+	-1.2+	-1.3+	-1.5+	-1.7+	-1.8+	-1.9+
19000	-1.1+	-1.2+	-1.4+	-1.7+	-1.9+	-2.1+	-2.2+
20000	-1.1+	-1.2+	-1.5+	-1.9+	-2.3+	-2.5+	-2.6+
20995	-1.0+	-1.1+	-1.6+	-2.3+	-3.0+	-3.5+	-3.6+
	180	150	120	90	60	30	0
	180	210	240	270	300	330	360

## Azimuth of Target - Degrees

## Latitude 30° (South)

NOTE: A negative sign means that the effect is to the right; a positive sign, to the left. For the argument at the top of the tables, use the sign that precedes the number; for the argument at the bottom, the sign that follows the number. Azimuth is measured clockwise from the North.

SHELL, H.E., MK.IIA2  
 FUZE, P.D., M51A1  
 MUZZLE VELOCITY, 2770 F/S

PART 2 TABLE K

ROTATION OF THE EARTH, DEFLECTION EFFECTS IN MILS, DUE TO

Latitude 40° (North)

Range Yards	Azimuth of Target - Degrees						
	0 360	30 330	60 300	90 270	120 240	150 210	180 180
1000	-0.1+	-0.1+	-0.1+	-0.1+	-0.1+	-0.1+	-0.1+
2000	-0.2+	-0.2+	-0.2+	-0.2+	-0.2+	-0.2+	-0.2+
3000	-0.3+	-0.3+	-0.3+	-0.3+	-0.3+	-0.3+	-0.3+
4000	-0.3+	-0.3+	-0.3+	-0.3+	-0.3+	-0.3+	-0.3+
5000	-0.4+	-0.4+	-0.4+	-0.4+	-0.4+	-0.4+	-0.4+
6000	-0.4+	-0.4+	-0.4+	-0.4+	-0.4+	-0.4+	-0.4+
7000	-0.5+	-0.5+	-0.5+	-0.5+	-0.5+	-0.5+	-0.5+
8000	-0.5+	-0.5+	-0.5+	-0.5+	-0.6+	-0.6+	-0.6+
9000	-0.6+	-0.6+	-0.6+	-0.6+	-0.7+	-0.7+	-0.7+
10000	-0.7+	-0.7+	-0.7+	-0.7+	-0.7+	-0.8+	-0.8+
11000	-0.8+	-0.8+	-0.8+	-0.8+	-0.8+	-0.9+	-0.9+
12000	-0.9+	-0.9+	-0.9+	-1.0+	-1.0+	-1.0+	-1.0+
13000	-1.0+	-1.0+	-1.0+	-1.1+	-1.1+	-1.1+	-1.2+
14000	-1.1+	-1.1+	-1.2+	-1.2+	-1.3+	-1.3+	-1.4+
15000	-1.2+	-1.2+	-1.3+	-1.3+	-1.4+	-1.5+	-1.6+
16000	-1.3+	-1.3+	-1.4+	-1.5+	-1.6+	-1.7+	-1.8+
17000	-1.4+	-1.4+	-1.5+	-1.7+	-1.8+	-1.9+	-2.0+
18000	-1.5+	-1.6+	-1.7+	-1.9+	-2.1+	-2.2+	-2.3+
19000	-1.6+	-1.7+	-1.9+	-2.1+	-2.3+	-2.5+	-2.6+
20000	-1.7+	-1.8+	-2.1+	-2.4+	-2.7+	-2.9+	-3.0+
20995	-1.8+	-1.9+	-2.4+	-3.0+	-3.5+	-3.9+	-4.1+
	180 180	150 210	120 240	90 270	60 300	30 330	0 360

Azimuth of Target - Degrees

Latitude 40° (South)

NOTE: A negative sign means that the effect is to the right; a positive sign, to the left. For the argument at the top of the tables, use the sign that precedes the number; for the argument at the bottom, the sign that follows the number. Azimuth is measured clockwise from the North.

SHELL, H.E., MK.IIA2  
FUZE, P.D., M51A1  
MUZZLE VELOCITY, 2770 F/S

## PART 2 TABLE K

## ROTATION OF THE EARTH, DEFLECTION EFFECTS IN MILS, DUE TO

## Latitude 50° (North)

Range Yards	Azimuth of Target - Degrees						
	0 360	30 330	60 300	90 270	120 240	150 210	180 180
1000	-0.1+	-0.1+	-0.1+	-0.1+	-0.1+	-0.1+	-0.1+
2000	-0.2+	-0.2+	-0.2+	-0.2+	-0.2+	-0.2+	-0.2+
3000	-0.3+	-0.3+	-0.3+	-0.3+	-0.3+	-0.3+	-0.3+
4000	-0.3+	-0.3+	-0.3+	-0.3+	-0.3+	-0.3+	-0.3+
5000	-0.4+	-0.4+	-0.4+	-0.4+	-0.4+	-0.4+	-0.4+
6000	-0.5+	-0.5+	-0.5+	-0.5+	-0.5+	-0.5+	-0.5+
7000	-0.6+	-0.6+	-0.6+	-0.6+	-0.6+	-0.6+	-0.6+
8000	-0.6+	-0.6+	-0.6+	-0.7+	-0.7+	-0.7+	-0.7+
9000	-0.7+	-0.7+	-0.7+	-0.8+	-0.8+	-0.8+	-0.8+
10000	-0.8+	-0.8+	-0.9+	-0.9+	-0.9+	-0.9+	-0.9+
11000	-0.9+	-0.9+	-1.0+	-1.0+	-1.0+	-1.0+	-1.0+
12000	-1.0+	-1.0+	-1.1+	-1.1+	-1.2+	-1.2+	-1.2+
13000	-1.2+	-1.2+	-1.2+	-1.2+	-1.3+	-1.4+	-1.4+
14000	-1.4+	-1.4+	-1.4+	-1.4+	-1.5+	-1.6+	-1.6+
15000	-1.6+	-1.6+	-1.6+	-1.6+	-1.7+	-1.8+	-1.8+
16000	-1.7+	-1.7+	-1.7+	-1.8+	-1.9+	-2.0+	-2.0+
17000	-1.8+	-1.8+	-1.9+	-2.0+	-2.1+	-2.2+	-2.3+
18000	-2.0+	-2.0+	-2.1+	-2.2+	-2.4+	-2.5+	-2.6+
19000	-2.2+	-2.2+	-2.3+	-2.5+	-2.7+	-2.9+	-3.0+
20000	-2.3+	-2.4+	-2.6+	-2.8+	-3.1+	-3.3+	-3.4+
20995	-2.5+	-2.7+	-3.0+	-3.5+	-4.0+	-4.4+	-4.6+
	180 180	150 210	120 240	90 270	60 300	30 330	0 360

Azimuth of Target - Degrees

## Latitude 50° (South)

NOTE: A negative sign means that the effect is to the right; a positive sign, to the left. For the argument at the top of the tables, use the sign that precedes the number; for the argument at the bottom, the sign that follows the number. Azimuth is measured clockwise from the North.

SHELL, H.E., MK.IIA2  
 FUZE, P.D., M51A1  
 MUZZLE VELOCITY, 2770 F/S

PART 2 TABLE K

## ROTATION OF THE EARTH, DEFLECTION EFFECTS IN MILS, DUE TO

Latitude 60° (North)

Range Yards	Azimuth of Target - Degrees						
	0 360	30 330	60 300	90 270	120 240	150 210	180 180
1000	-0.1+	-0.1+	-0.1+	-0.1+	-0.1+	-0.1+	-0.1+
2000	-0.2+	-0.2+	-0.2+	-0.2+	-0.2+	-0.2+	-0.2+
3000	-0.3+	-0.3+	-0.3+	-0.3+	-0.3+	-0.3+	-0.3+
4000	-0.3+	-0.3+	-0.3+	-0.3+	-0.3+	-0.3+	-0.3+
5000	-0.4+	-0.4+	-0.4+	-0.4+	-0.4+	-0.4+	-0.4+
6000	-0.5+	-0.5+	-0.5+	-0.5+	-0.5+	-0.5+	-0.5+
7000	-0.6+	-0.6+	-0.6+	-0.6+	-0.6+	-0.6+	-0.6+
8000	-0.7+	-0.7+	-0.7+	-0.7+	-0.7+	-0.7+	-0.7+
9000	-0.8+	-0.8+	-0.8+	-0.8+	-0.8+	-0.8+	-0.8+
10000	-1.0+	-1.0+	-1.0+	-1.0+	-1.0+	-1.0+	-1.0+
11000	-1.2+	-1.2+	-1.2+	-1.2+	-1.2+	-1.2+	-1.2+
12000	-1.3+	-1.3+	-1.3+	-1.3+	-1.3+	-1.3+	-1.3+
13000	-1.4+	-1.4+	-1.4+	-1.4+	-1.5+	-1.5+	-1.5+
14000	-1.6+	-1.6+	-1.6+	-1.6+	-1.7+	-1.7+	-1.7+
15000	-1.8+	-1.8+	-1.8+	-1.8+	-1.9+	-1.9+	-1.9+
16000	-1.9+	-1.9+	-2.0+	-2.1+	-2.1+	-2.2+	-2.2+
17000	-2.1+	-2.1+	-2.2+	-2.3+	-2.4+	-2.5+	-2.5+
18000	-2.3+	-2.4+	-2.5+	-2.6+	-2.7+	-2.8+	-2.8+
19000	-2.5+	-2.6+	-2.7+	-2.9+	-3.0+	-3.1+	-3.2+
20000	-2.8+	-2.9+	-3.0+	-3.2+	-3.4+	-3.6+	-3.6+
20995	-3.2+	-3.3+	-3.6+	-4.0+	-4.4+	-4.7+	-4.8+
	180 180	150 210	120 240	90 270	60 300	30 330	0 360

Azimuth of Target - Degrees

Latitude 60° (South)

NOTE: A negative sign means that the effect is to the right; a positive sign, to the left. For the argument at the top of the tables, use the sign that precedes the number; for the argument at the bottom, the sign that follows the number. Azimuth is measured clockwise from the North.

PART 2 TABLE K

ROTATION OF THE EARTH, DEFLECTION EFFECTS IN MILS, DUE TO

Latitude 70° (North)

Range Yards	Azimuth of Target - Degrees						
	0 360	30 330	60 300	90 270	120 240	150 210	180 180
1000	-0.1+	-0.1+	-0.1+	-0.1+	-0.1+	-0.1+	-0.1+
2000	-0.2+	-0.2+	-0.2+	-0.2+	-0.2+	-0.2+	-0.2+
3000	-0.3+	-0.3+	-0.3+	-0.3+	-0.3+	-0.3+	-0.3+
4000	-0.4+	-0.4+	-0.4+	-0.4+	-0.4+	-0.4+	-0.4+
5000	-0.5+	-0.5+	-0.5+	-0.5+	-0.5+	-0.5+	-0.5+
6000	-0.6+	-0.6+	-0.6+	-0.6+	-0.6+	-0.6+	-0.6+
7000	-0.7+	-0.7+	-0.7+	-0.7+	-0.7+	-0.7+	-0.7+
8000	-0.7+	-0.8+	-0.8+	-0.8+	-0.8+	-0.8+	-0.8+
9000	-0.8+	-0.9+	-0.9+	-0.9+	-0.9+	-0.9+	-1.0+
10000	-1.0+	-1.1+	-1.1+	-1.1+	-1.1+	-1.1+	-1.1+
11000	-1.2+	-1.2+	-1.2+	-1.2+	-1.2+	-1.2+	-1.2+
12000	-1.3+	-1.4+	-1.4+	-1.4+	-1.4+	-1.4+	-1.4+
13000	-1.5+	-1.6+	-1.6+	-1.6+	-1.6+	-1.6+	-1.6+
14000	-1.7+	-1.7+	-1.8+	-1.8+	-1.8+	-1.8+	-1.8+
15000	-1.9+	-1.9+	-2.0+	-2.0+	-2.0+	-2.0+	-2.0+
16000	-2.1+	-2.1+	-2.2+	-2.2+	-2.3+	-2.3+	-2.3+
17000	-2.3+	-2.3+	-2.4+	-2.5+	-2.6+	-2.6+	-2.6+
18000	-2.6+	-2.6+	-2.7+	-2.8+	-2.9+	-2.9+	-3.0+
19000	-2.9+	-2.9+	-3.0+	-3.1+	-3.2+	-3.3+	-3.4+
20000	-3.2+	-3.3+	-3.4+	-3.5+	-3.6+	-3.7+	-3.8+
20995	-3.8+	-3.9+	-4.1+	-4.3+	-4.6+	-4.8+	-4.9+
	180 180	150 210	120 240	90 270	60 300	30 330	0 360

Azimuth of Target - Degrees

Latitude 70° (South)

NOTE: A negative sign means that the effect is to the right; a positive sign, to the left. For the argument at the top of the tables, use the sign that precedes the number; for the argument at the bottom, the sign that follows the number. Azimuth is measured clockwise from the North.



